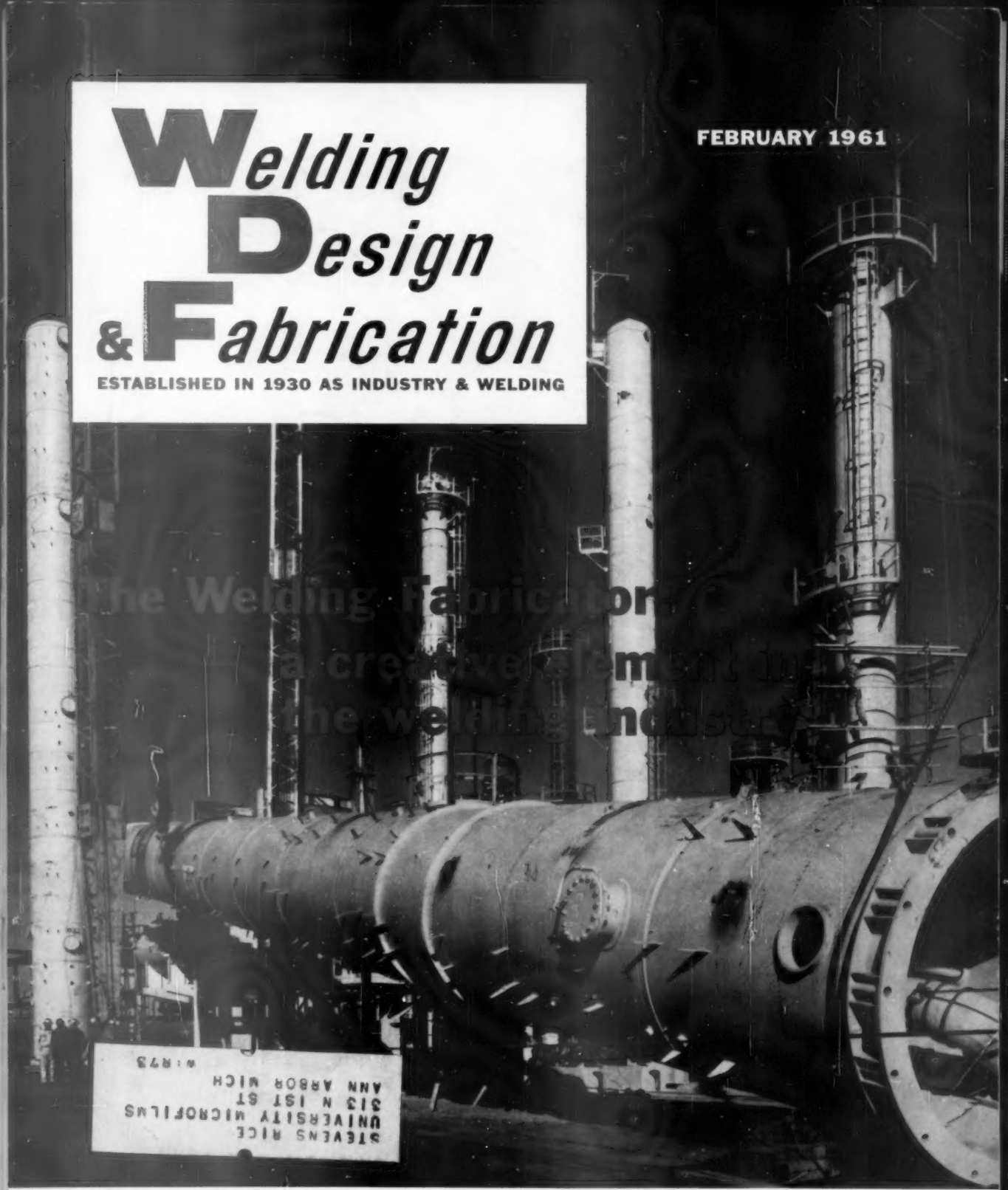
Welding Design & Fabrication

ESTABLISHED IN 1930 AS INDUSTRY & WELDING

FEBRUARY 1961



AN INDUSTRIAL PUBLISHING CORPORATION MAGAZINE

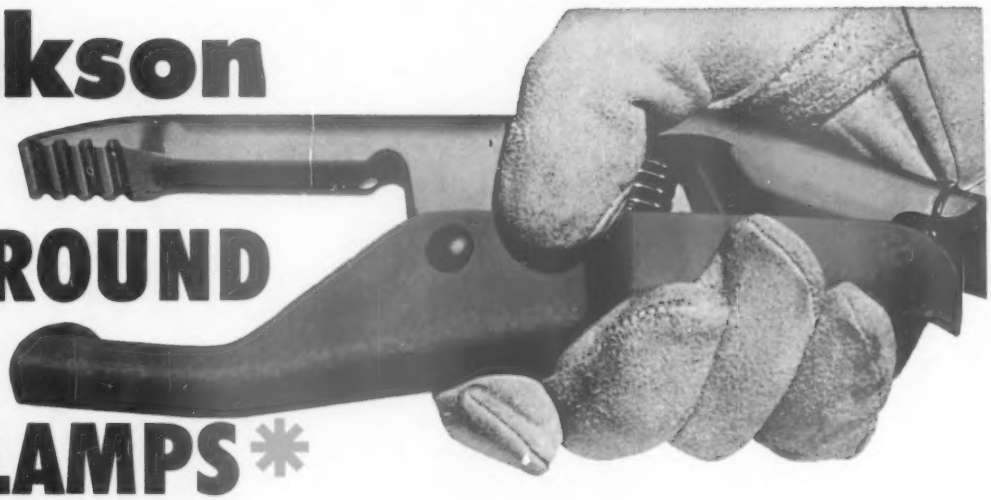
ALSO IN THIS ISSUE

ELECTRONICS INDUSTRY MINIATURIZES WITH WELDED PACKAGING

CLOSE CONTROL OF PREHEATING CAN PREVENT WELD FAILURES

TWO WELDING HEADS ARE FASTER THAN ONE

Jackson GROUND CLAMPS*



CABLE CONNECTORS†

& CABLE LUGS

* Jackson Ground Clamps work easily and efficiently. One end fits the hand, with finger-grooved lower tong. Proper placement—current-carrying upper tong on top where you're sure of good contact—is natural and easy.

The business end fits the job. The contact area of the copper alloy upper tong is large and flat, with serrations that bite through surface film. Greater contact area carries current efficiently. New melamine-impregnated fiber glass insulators at pivot keeps current out of lower tong.

† Jackson 'Quik-Trik' Cable Connectors have streamlined Neoprene rubber insulators that lock out moisture, dirt, and don't catch on obstructions. Cable connects mechanically, or by soldering or brazing. The reduced tip diameter on the tapered plug takes hard knocks without forming a burr that will interfere with the mating of the halves.

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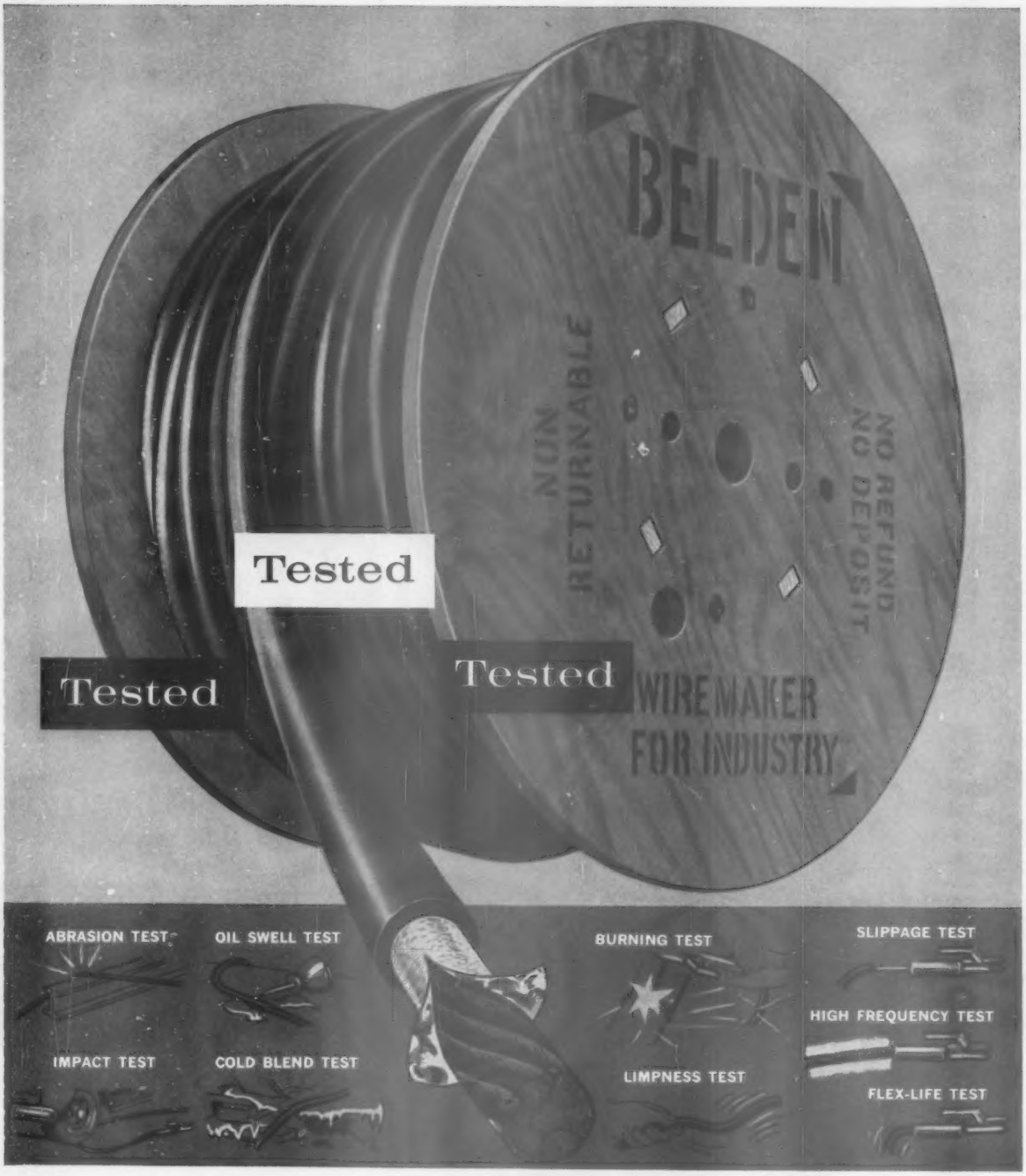

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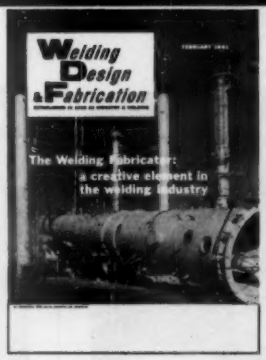

for February, 1961

COVER: This deisobutanizer tower is being erected as a part of an alkylation unit. It is 9-feet in diameter and 166-feet long and is considered the tallest refinery tower of its type in the Southwest. The vessel and others were completely shop-fabricated by a large plate fabricator and shipped to the job-site in one piece, ready for installation.

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Sometimes brazing fabricators do more than just braze; their know-how often results in changes that make a better, stronger part.

63 IS EXPLOSIVE WELDING THE NEWEST METAL JOINING PROCESS?
Techniques are being developed for joining metals and metal combinations that are difficult or impossible to weld by other processes.

64 NEW SEMI-AUTOMATIC PROCESS SPEEDS ARC WELDING OF MILD STEEL
A Chicago manufacturer uses this new process to increase welding speed and improve weld quality on butt welds in open-web steel joists.

66 TWO WELDING HEADS ARE FASTER THAN ONE
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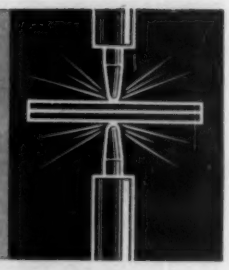
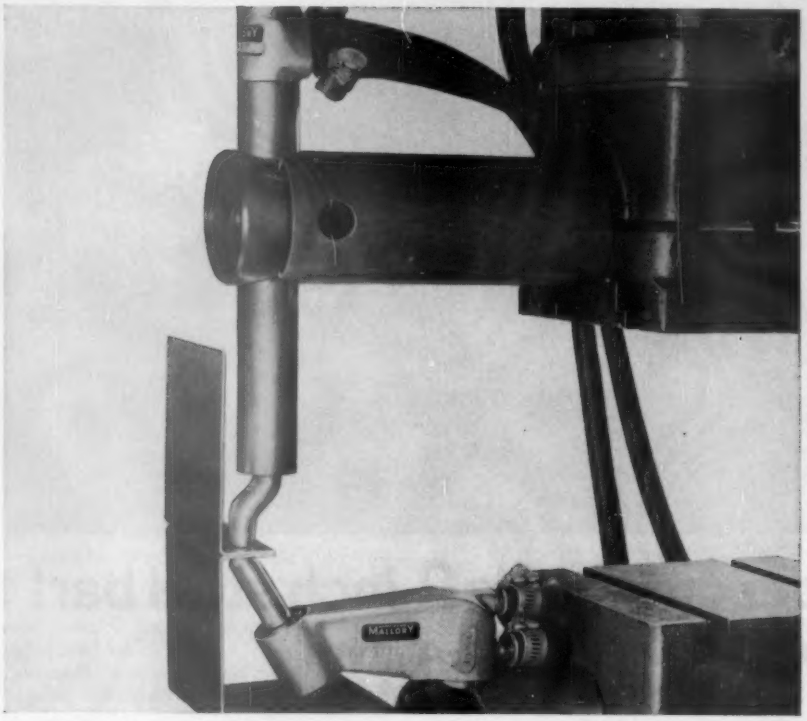
MALLORY MEMOS

NEWS AND TIPS ON RESISTANCE WELDING

Mallory Metallurgical Company, Indianapolis 6, Indiana





"Special" set-ups are easy with standard Mallory components

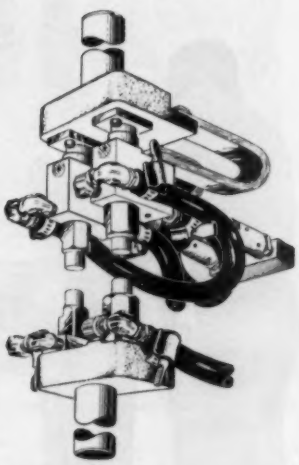
Take this set-up, for instance. Looks tricky, but standard Mallory holders and electrodes that a distributor near you *carries in stock* do the job excellently . . . and economically.

Top electrode is a double bend Mallory 3 electrode, part No. 19-2521, in a 200-Series holder. At bottom is a 30° offset electrode (part No. 16-2495) in a 500-Series offset holder with 30° head.

Whether your set-up is straightforward or special, see your Mallory distributor. He can save you time and money by supplying you promptly from his broad line of standard Mallory supplies . . . the quality line that gives you more welds per dollar.

WELDING HINTS

Galvanized and aluminized steels are sometimes tricky to resistance weld, due to the tendency of welding electrodes to pick up coating material. Our recommendation, based on tests: Mallory 28 alloy electrodes. Get them from your distributor.



Equalizing welding pressures on multi-weld set-ups is a cinch when you use a "Nu-Twist"®Hydraulic Equalizing Die Assembly. Closed hydraulic system automatically keeps pressure constant on each weld, regardless of minor variations in electrode wear, die alignment or thickness of stock.

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Even the newest super alloys can be cut at 3 to 6 seconds per square inch on the Sever-All Model 1-A dry abrasive cutting machine. The burn-free slices of hardened steel shown above are typical of the cuts you'll get on almost any metal. *You get this speed and quality for an investment of approximately $500!*

You get big capacity, too, with the Model 1-A—up to 2" square solids, 3½" O.D. pipe and tubing, 3" angle iron and 4" channels. You can cut practically any metal. On top of that, wheel oscillation—an "exclusive" in this price range—provides cooler cutting, longer wheel life.

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Liquidweld apparatus licks high-priced maintenance, labor costs and down time. If you're not using Liquidweld cutting torches, you're losing money.

Cutting torches perform rugged duties . . . and undergo rugged treatment.

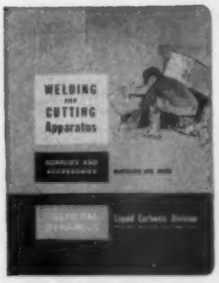
Liquidweld cutting torches are built to withstand heavy-duty use. With all cutting torches, however, head seats can become damaged, causing backfiring and leaks.

Results: seat-reaming; metal-removing. In all other cutting torches, this would call for repair shop maintenance with subsequent high-cost labor and loss of use-time.

Use a Liquidweld torch and you merely drop in a replaceable mixer sleeve, right on the job. Presto! Your Liquidweld torch is ready to perform at top efficiency again.

Ask your Liquid Carbonic representative about the handy do-it-yourself repair kit that allows Liquidweld apparatus to lick its own wounds.

For complete information on torches and regulators that are as perfectly balanced as the finest rifles, send in the coupon for our new, complete catalog.



Send for your free copy of the new Welding and Cutting Apparatus Catalog No. 5900. Use coupon below. Some distributor areas still available.

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SET KNIFE CLEARANCE AT 8% OF METAL THICKNESS

Turning hand crank "A" changes knife clearance "C". This is indicated on gauge "B". There are no bolts to loosen, no parts to move. The adjustment is easily made in 10 seconds.

8% is a good figure to remember when shearing mild steel. By adjusting the clearance between the knives to 8% of the thickness of steel being cut, you will get the best cuts and the knives will stay sharp longer.

Because of the importance of having the right knife clearance for every shearing job, Steelweld Shears were designed to make this adjustment extremely easy. In fact, it can be made in 10 seconds. Consequently, it becomes a natural routine part of a shear operator's job.

You will find this feature invaluable if you shear various thicknesses. It eliminates the need of working with some fixed compromise knife clearance setting with resultant cuts that vary from the ideal more or less as the knife adjustment is off from the correct setting.

Steelweld Shears are the most modern on the market today with more features that make for speed, accuracy and long trouble-free operation. Some of their fine features are not obtainable in any other machine.

Series 8D-12 Steelweld Shear for cutting steel to 12' x ½". A stainless steel plate 7' x ⅜" is shown being cut. Various thickness plates, as well as heavy steel grating, are also cut on this machine, which is in a West Coast plant. Knives on this hard-working shear last 3 to 6 months before they need to be turned to another cutting edge.

Write for free copy of Catalog No. 2011
Gives construction and engineering details

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PIVOTED BLADE **SHEARS**

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The correct selection of flux can offer unexpected help in speeding and simplifying production, minimizing rejects and lowering costs in low temperature silver brazing operations. The advantages to be gained by "selective fluxing" are *sufficiently important to warrant careful, thorough study!*

Silvaloy offers the most advanced flux developments in this specialized field. Here, is *a complete line of fluxes . . .* each providing outstanding performance, enabling you to select the correct flux for every possible low temperature brazing operation. The extra efficiency of Silvaloy "Selective Fluxing" is being proved daily on the brazing production lines of the country's leading manufacturers.

Call the Silvaloy distributor in your area for consultation and detailed information or, send for our booklet "A Complete Guide to Selective Fluxing for Low Temperature Silver Brazing."

Silvaloy fluxes are packaged in 65-lb. and 30-lb. drums, 5-lb. wide mouth jars (5 to a carton), 1-lb. and ½-lb. jars. The wide opening of the 5-lb. package makes it a most practical, time saving dispenser that also enables the operator to make use of every bit of flux in jar.

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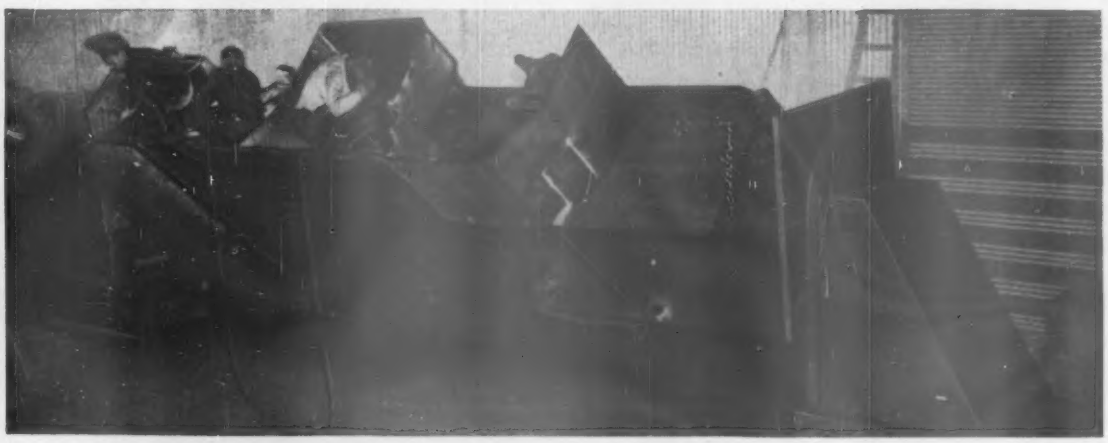
WELDING AT WORK

to do the job better and cheaper

Nine-Nickel steel sphere is metalworking milestone

COATESVILLE, PA.: The 108-inch steel hemisphere marked "500" represents a major metalworking milestone. It is the 500th such head produced from the relatively new Nine-Nickel alloy by Lukens Steel Co. for the cryogenics industry. Here Lukens' president, Charles L. Huston, Jr. (right), turns over the Nine-Nickel hemisphere to C. R. Rickel, president of Big Three Welding Supply Co., Fort Worth, a top independent in the fast-growing liquid oxygen field.



Positioner eliminates vertical welding

FRANKLIN, PA.: This Aronson 32,000 pound head-and-tailstock positioner eliminated 400 inches of vertical welds in shuttle cars made here by Joy Manufacturing Co.

The cars weigh 15,000 pounds, are 25 feet long and 10 feet high.

Problem: Car bodies had been welded by tipping them on a 45° angle, using an overhead crane and blocking them in position. This method positioned the car body so a major part of the welds could be done downhand, using ¼ inch E6012 electrodes. The outside seams (most of them multi-pass welds) were welded in the same position, using a vertical downhand weld.

Solution: The new positioner rotates the cars so each seam is in a downhand or flat position. This permitted changing to a faster, iron powder electrode. The 3/16 inch and 1/4 inch E6014 and E6024 electrodes are now used on all inside seams and outside seams, using single pass downhand welds. This eliminated 400 inches of vertical welding.

Using the positioner eliminated unnecessary build-up, improved weld quality, and gave better looking welds.

HOW DO YOU WELD STAINLESS?

With stick electrodes?..by gas shielded metal arc welding (Aircomatic®)?..by gas shielded tungsten arc welding (Heliweld)?

Airco supplies electrodes or wire for *all three*, can give unbiased advice, broad selection. Are the stainless steels that you weld light gauge or heavy . . . martensitic, ferritic or austenitic . . . subject to heat, corrosion or stress? Whatever the application, Airco supplies electrodes or wire to weld them *better*.

For stick electrode welding: choose from 36 Airco Stainless Electrode types. They give you high welding speed with low heat input. Welds are smooth, spatter is minimal, cleaning and polishing are easy. Bonus: electrodes are protected in Airco's exclusive resealable "POP" can; it keeps them factory-fresh down to the last electrode.

For inert gas shielded processes: depending on application, you'll choose either AIRCOMATIC® gas shielded metal arc welding—or Airco's HELIWELD gas shielded tungsten arc welding. For both of these processes, Airco Stainless steel welding or filler wire gives excellent corrosion resistance and excellent tensile, ductility and impact properties.

Which is best for you? Call Airco for an unbiased answer—for *only* Airco makes equipment for all three processes. Look in Classified Telephone Directory under "Welding Equipment and Supplies" for your nearest Authorized Airco Distributor. Write today for a copy of Airco's "Electrode Pocket Guide" and "Aircomatic Welding Wire Pocket Guide."

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WELDING MANAGEMENT

watches these developments

THIS BRILLIANTLY LIGHTED sign keeps Cleveland aware of welding. The 90-foot-long and 40-foot-wide animated, electrically-powered unit is located on top of one of Burdett's plants. It shines in six colors towards Cleveland's East Shoreway where an estimated 80,000 cars pass in one day. About 1800 feet of neon tubing and 45 incandescent lamps animate the figure of a workman cutting steel. A brilliant electric shower of make-believe sparks fall on the Burdett name.

A PRICE REDUCTION of more than 20 percent on their Easyarc line of metal powder stainless steel electrodes has been announced by Air Reduction Sales Co. Under the new price scale, for example, Easyarc 308 electrodes have been reduced in price from 98 cents to 78 cents per pound for 250 pound quantities. Similar reduction were made in 1,000, 5,000, and over 10,000 pound quantities. Prices are for Zone 1.

A BRITISH PATENT on ultrasonic welding equipment and methods and a British and a Canadian Patent on a support mount for such vibratory devices have been granted to Aeroprojects Incorporated, West Chester, Penna. These are the first foreign patents granted to the company.

Aeroprojects recently gave the Aluminum Company of America rights to sell and to license the manufacture of Sonobond ultrasonic metal joining equipment throughout the world (except in the United States and Canada).

SALES TO INDUSTRY of nondestructive testing equipment will continue to expand sharply in 1961 for products that require tight quality control, but volume sales for testing mass production will rise only in proportion to practical money-saving applications discovered, according to Picker X-Ray Corp. John A. Reynolds, Picker's technical director, noted that the comparatively new field of industrial testing (X-ray, radioisotopes, magnetic particles, and dye penetrants) is showing a strong percentage growth. These procedures, he added, save millions of dollars annually by allowing inspection inside of solid and sealed product without opening or destroying them.

Editor's Note: Next month, our annual Nondestructive Testing Issue, will feature a series of case histories that show how nondestructive testing saves money in the inspection of weldments and brazed products.

UNITED STATES PRODUCTION of gases and carbide are listed in figures released by the U. S. Department of Commerce, Bureau of the Census. They permit a comparison of the first half of 1960 with the same period in 1959.

	Production, first 6 months	
	1959	1960
Acetylene	5,990	6,340 million cu. ft.
Calcium Carbide	507,451	570,393 short tons
Oxygen, high purity	26,667	29,068 million cu. ft.
Oxygen, tonnage	703,778	750,759 short tons
Nitrogen	5,818	7,959 million cu. ft.
Argon	233	287 million cu. ft
Hydrogen	26,020	34,136 million cu. ft.

REVISED STANDARDS on regulators and torches have been issued by the Underwriters' Laboratories. These third editions of the standards were prepared in conjunction with International Acetylene Association and are dated August, 1960. Copies may be obtained *not from IAA*, but by writing to Underwriters' Laboratories, Inc., 207 East Ohio Street, Chicago 11, Illinois. Ask for Standard UL 252, "Gas Pressure Regulators", and Standard UL 123, "Torches, Oxy-Fuel Gas".

A WELDED TIME CAPSULE was recently buried at the 80-acre site of the new American Society for Metals national headquarters, near Cleveland. It contains metallurgical documents and is intended to be dug up in 300 years. The copper-aluminum container was welded shut at A. O. Smith's Milwaukee welding laboratory. An inert-gas, tungsten-arc process was used. Prior to final welding, the capsule was flushed with argon to assist in preserving the contents.

INDUSTRIAL USE of the platinum metals is in a definite long-term uptrend, according to a year-end statement by Charles W. Engelhard, president and board chairman of Engelhard Industries, Inc. He said that 1960 may have seen an alltime record for these precious metals (platinum, palladium, iridium, rhodium, ruthenium, and osmium) and that 1961 is shaping up as another good year in this field.

For More Information Circle No. 65 on Reader Service Card.

Material Evidence — NOBODY PUTS AS MUCH INTO A WELDING MACHINE AS A. O. SMITH

To prove our case — that only A. O. Smith still makes an Extra-Heavy-Duty welding machine—we've put our evidence on the table. We submit that, while other machines have been "trimmed down" to sell for less, A. O. Smith Extra-Heavy-Duty welders have all the "guts" the old-timers had. That there has been no stinting on copper, iron or power. That there has been no attempt to cut corners on materials and components—no compromise with value to meet a price.

Examine the evidence! Then make your own value analysis. We are sure that the verdict will be in favor of A. O. Smith — that it's sound judgement to pay a little more for much more machine. Analyze the value when you consider the price. It's value that pays off in longer life and superior performance.

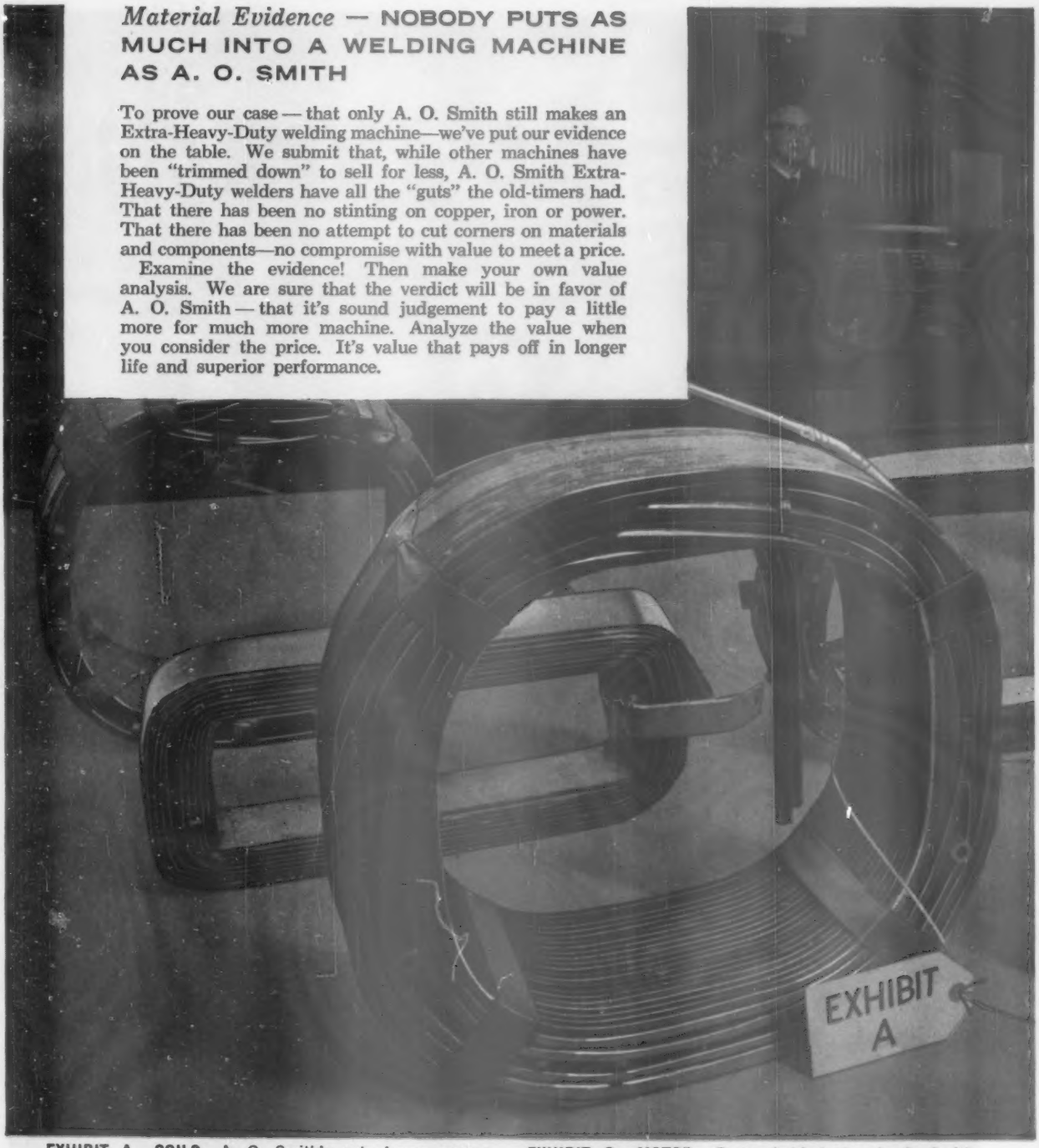


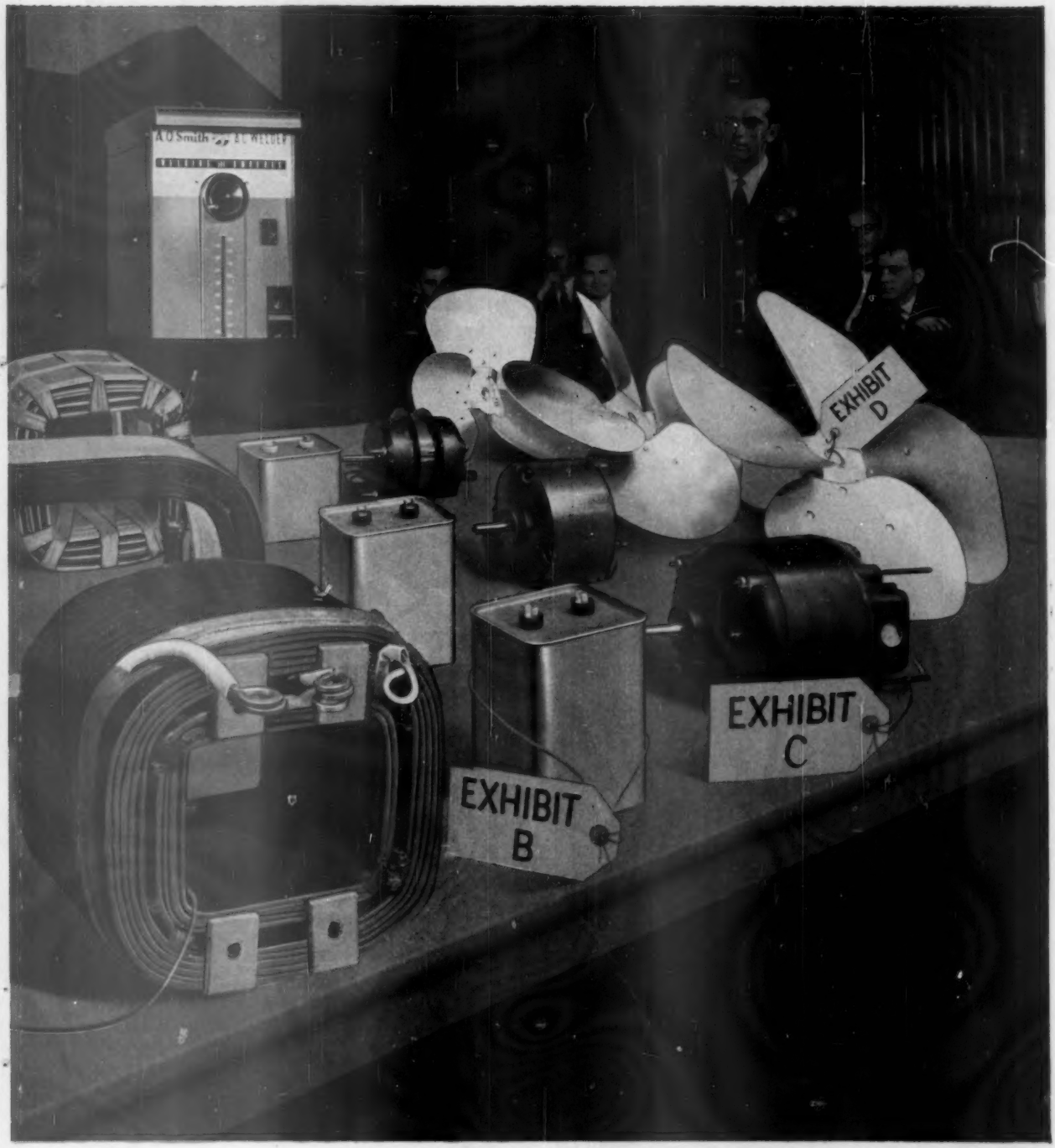
EXHIBIT A — COILS A. O. Smith's extra-heavy copper secondary (at left) and primary (at right) coils are the heaviest in the field — together weigh 185 lbs. Note how competitive coils skimp on material. Here's heavy-duty value that adds up to longer production life . . . a machine that operates on a temperature rise of only 55°C — lowest of any machine on the market.

EXHIBIT B — CAPACITORS Standard with A. O. Smith Extra-Heavy-Duty welders is the industry's maximum power factor correction — 134 M.F.D. total. This high power factor means that the current taken from the primary line is lower than with any other machine when comparable ratings are matched — value that means money in your pocket through lower power bills.

EXHIBIT C — MOTOR Power behind the A. O. Smith extra-heavy-duty cooling system is big, totally enclosed lifetime-lubricated motor. Note "junior-size" motors used by competitive welders. Only A. O. Smith's heavy-duty motor supplies dependable starting torque . . . provides more air for cooler operation and longer machine life.

EXHIBIT D — FAN Biggest fan in the field. Air is circulated by an 18-inch industrial-type fan blade as compared to fans much smaller on other welding machines. And A. O. Smith's blade is dynamically balanced, scientifically pitched to deliver maximum ventilation down through the coils. Blast guides direct full force of the fan right on target.

For More Information Circle No. 65 on Reader Service Card.



COURT CALENDAR

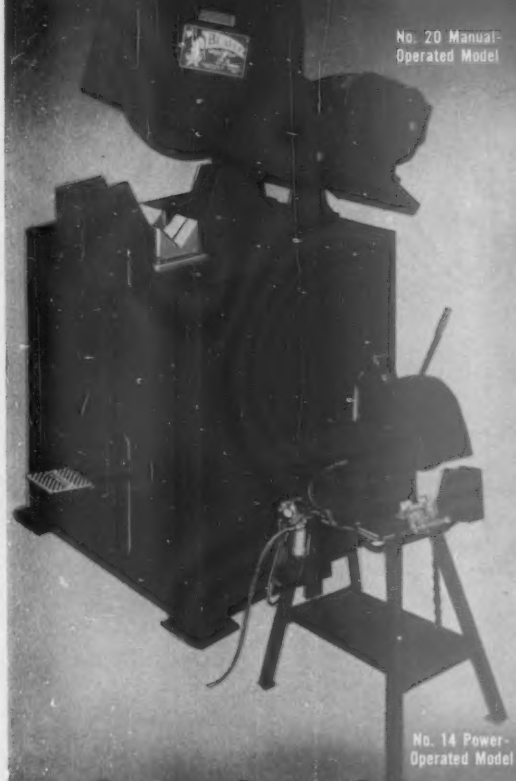
Case for value analysis — A. O. SMITH EXTRA-HEAVY-DUTY welding machine versus the field. Exhibits shown in front row on table are principal components used in the standard A. O. Smith EXTRA-HEAVY-DUTY welding machine. Comparable components used in other well known brand welding machines are displayed in rear rows.

Through research ... a better way

A.O.Smith
CORPORATION
WELDING PRODUCTS DIVISION
Milwaukee 1, Wisconsin
A.O.Smith INTERNATIONAL S.A., Milwaukee 1, Wis., U.S.A.

For More Information Circle No. 65 on Reader Service Card.

TIME! COSTS!
ALMOST
IN SECONDS!



Speed Cut

Abrasive Cutting Machines
MANUAL OR POWER-OPERATED MODELS
FOR WET, DRY OR ANY-ANGLE CUTTING!

Speed Cut — *Send for complete catalog and name of nearest distributor*

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LOW COST MOGUL®
METALLIZING

SALVAGE CUSTOMERS' $$$ AND TIME ON DEFECTIVE OR WORN PARTS . . . BUILD SHOP PROFITS!

Metallizing Guns Spray On
carbon, stainless steels, babbitts, bronze, nickel, brass, aluminum, tin, zinc; hard ceramic facings, to correct mis-machining, wear, or damage. Keep your shop humming profitably.

Rebuild GOOD AS NEW! SAVE UP TO 90% OF REPLACEMENT COSTS
even on giants such as a $4,000 centrifugal pump part. Avoid costly downtime awaiting new parts, too.

POWDER-JET® GUNS
spray ceramic hard facing alloys, metal powders.

TURBO-JET® GUN
with patented Magnetic Governor Controls — sprays wires or rods.

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Write or phone SAcramento 2-3710 for details of DISTRIBUTOR TERRITORIES open.

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For More Information Circle No. 50 on Reader Service Card.

MEN ON THE MOVE

in the welding industry

MILNE

WILLIAMS

PLANTING

BLODGET

PROMOTIONS:

G. R. Milne is president of Air Reduction Chemical and Carbide Company, New York City. This new division of Air Reduction Company, Inc., consolidates three chemical divisions: Air Reduction Chemical Company, Colton Chemical Company, and National Carbide Company.

J. J. Williams is assistant vice president in charge of sales for Alloys Rods Co., York, Penna.

The Lincoln Electric Co., Cleveland, has named **C. O. Planting** district manager of its Detroit sales territory.

Three promotions have been made by Air Reduction Sales Co. They are **A. S. Blodget, Jr.,** regional vice president of the company's midwestern region; **Van Dorn Bowling, Jr.,** assistant manager of distributor sales in Houston; and **Joseph P. Casalis, Jr.,** district manager in St. Louis. Mr. Casalis succeeds **W. M. Holley** who became owner of Sanders Welding Supply Co., St. Louis.

Harry C. Robeson has been named vice-president and assistant general manager of Detroit Stamping Co., Detroit.

continued on page 18

NOW ATLAS OFFERS...

"Long Nek" Tomahawks

IF YOU WANT THE "MOST" IN A FULL WOOD HANDLE TOMAHAWK— GET A NEW "LONG-NEK" (WH) MODEL

Here's what the new "Long Nek" tomahawks offer: 50% greater support for the handle ● Protection of handle from splintering caused by working over an edge ● Less chance of handles loosening in the head ● Atlas wide-blade design that removes slag faster and adds to the life of the tool ● Hand-fitted hardwood handles ● Balance and "feel" that welders agree make their job easier

Come in three head styles to suit you and the job.

Tough!

Atlas makes 33 different weld cleaning tools. There's one for every purpose and preference—Ask your welding supply dealer to show them to you.

ATLAS
WELDING ACCESSORIES INCORPORATED
707 E. LEWISTON
FERNDALE 20, MICH.

For More Information Circle No. 10 on Reader Service Card.

WELDING PROBLEM?

Time after time, you'll find the answer in the WELDING DESIGN & FABRICATION DATA BOOK. Engineers rely on it as their No. 1 source for welding and fabricating all metals. Buyers and specifiers of welding, cutting and brazing equipment and supplies find it indispensable as their direct line to sources of supply.

The 1962/63 edition will be the most comprehensive ever. Publication date is November, 1961. Registered copies @ $12.00 may be reserved now. Please send your order to WELDING DESIGN & FABRICATION DATA BOOK, 812 Huron Road, Cleveland 15, Ohio.

Welding equipment manufacturers: Ask for details on advertising your products and services in this important buyers' guide!

1962/63 edition: 6 sections, 930 pages, 350 product groups, 341 pages of engineering data, 240 pages of specification advertising

MEN ON THE MOVE

continued from page 17

PROMOTIONS:

J. H. Berryman has been named manager of Air Reduction Sales Company's Special Products Department in Union, N. J. At the same time, **Robert A. Stone** was named sales manager.

John W. Eder is general sales manager at Chicago Eye Shield Co. Eder is a graduate of the University of Southern California. He had been assistant sales manager of the company and prior to that was associated with the safety equipment industry for several years.

Arcos Corporation, Philadelphia, has named **Robert W. Anderson** sales manager of its New England district with headquarters in Boston.

New vice president at champion Rivet Co., Cleveland, is **David J. Champion.** Also at Champion, **Joseph A. Diemer** has been named assistant to the president.

APPOINTMENTS:

SIEBERT

TATE

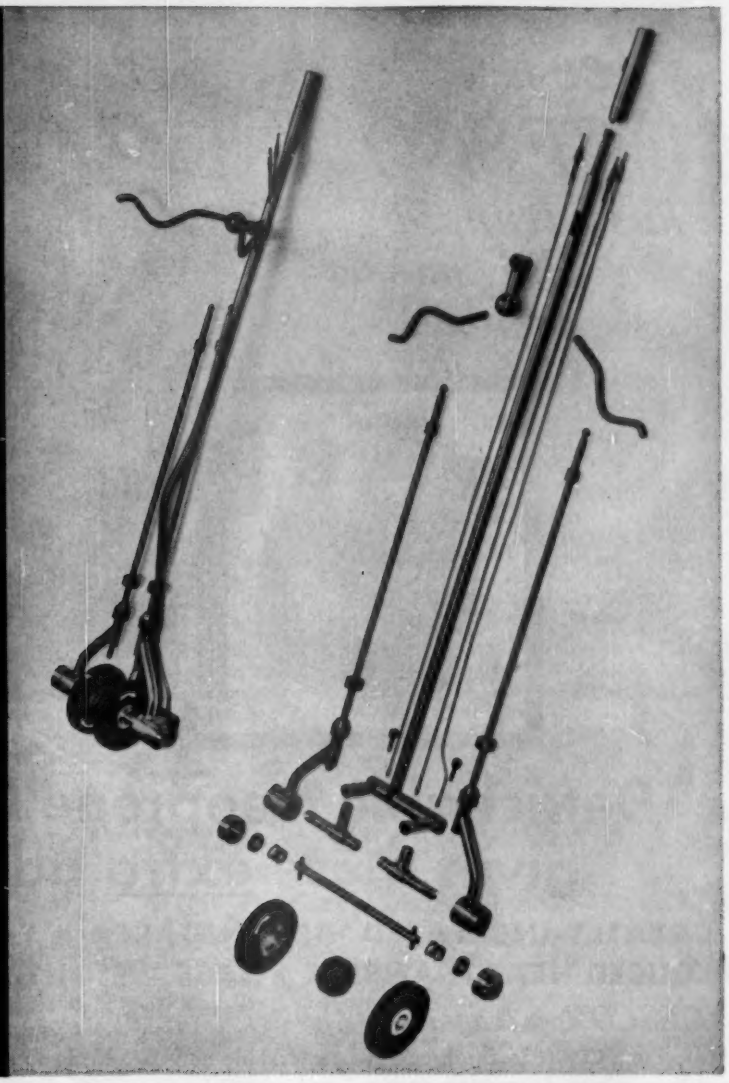
Carl J. Siebert, Jr., is general sales manager for Aronson Machine Co., Inc., Arcade, N. Y.

Jackson Products, Warren, Michigan, has named **Kenneth C. Tate** Pacific Northwest regional representative with headquarters in Portland. **George Sloan** serves the southern part of the Pacific Coast area.

continued on page 21

HERE'S HOW STILL ANOTHER MANUFACTURER JOINS STAINLESS STEEL TUBING:

He uses Handy & Harman's BRAZE 630



He's one of many manufacturers and fabricators who have found—to their lasting satisfaction—that Handy & Harman silver alloy brazing is the final answer to stainless steel joining problems.

Super-Donic Manufacturing Company, Atlanta, Georgia, manufactures "Dual Arm Transmissions" for the dental industry. Most everybody has—at one time or another—seen and/or felt this unit in operation.

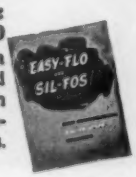
It is fabricated of small diameter 304 and 316 stainless steel tubing and, in its assembled form, consists of some 17 separate brazed joints. Joints must be strong, corrosion resistant and neat-appearing.

Each of the 17 joints is hand-torch brazed with Handy & Harman BRAZE 630 wire and HANDY FLUX TYPE B-1. There's no question that this is a unique application. There's no question, either, that the application is stainless steel. The ease and economy with which this manufacturer solves his problems can be just as readily applied to *your* stainless steel joining problems.

Strength, production speed, electrical and thermal conductivity, gas and liquid tightness and low cost are *natural* benefits of silver alloy brazing. We think it worth your while to learn more about this remarkable metal-joining method—we'll be glad to send you any information you ask for. Handy & Harman, 82 Fulton St., New York 38, N. Y.

FOR A GOOD START: BULLETIN 20

This informative booklet gives a good picture of silver brazing and its benefits... includes details on alloys, heating methods, joint design and production techniques. Write for your copy.



Your No. 1 Source of Supply and Authority on Brazing Alloys

HH

HANDY & HARMAN

General Offices: 82 Fulton St., New York 38, N. Y.

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Toronto, Canada

For More Information Circle No. 31 on Reader Service Card.

See how CESCO has advanced welding helmet design!..

Detachable Neoprene Lens Retainer gives these extra advantages:

GREATLY INCREASED VIEWING AREA • FAR LESS LENS BREAKAGE
REDUCED HEAT TRANSFER • LESS WEIGHT, MORE WEARER COMFORT

CESCO does it again!..

From CESCO research comes a remarkable new welding helmet design with features and advantages like you've never seen in a helmet before. The **No. 401-17 helmet** shown here has a one-piece neoprene lens retainer which mounts directly to the fiber glass shell by means of moulded channels. Rubber tabs—integral parts of the retainer—hold filter, outer and inner lenses securely in place. An excellent shock absorber, the retainer greatly reduces lens breakage due to dropping or bumping the helmet. Yet when lens replacement is necessary, this can be done quickly and easily without the aid of tools.

Made to accommodate Cescoweld glass lenses or CESCO Plasti-Weld plastic filters 4½" x 5¼", the 401-17 has over twice the viewing area of regular helmets. This increased visibility, especially in the downward viewing plane, is most beneficial to wearers of bi-focal glasses. Moreover, when equipped with Plasti-Weld filters, the helmet weighs nearly one-half pound less than helmets of similar size with glass lenses and metal retainers.

Nylon headgear with broad cross strap is adjustable for height and position. Foam cushion on cross strap and brow bar provides added comfort.

***ATTENTION DISTRIBUTORS:** You're invited to inquire about CESCO's new sales and distribution policy for welding equipment distributors*

CESCO

For More Information Circle No. 18 on Reader Service Card.

MEN ON THE MOVE

continued from page 18

APPOINTMENTS:

HAND

JOHNSON

Alloy Rods Company, York, Pa., has named two new district managers. **C. C. Hand** will have headquarters at the company's branch office in Pittsburgh. **M. L. Johnson** will cover the Western states from the company's El Segundo, California, branch.

Richard L. Carpenter has been appointed manager of the Dallas Service & Training Center of Eutectic Welding Alloys—Southwestern Division.

Jack Weir has joined the sales staff at Fibre-Metal Pacific, Inc., Los Angeles.

R. C. Morrison has joined Metalock International, Inc., Long Island City, N. Y., as vice president and general manager. He had been associated with United Specialties, Inc.

ELECTIONS:

Two new vice presidents were elected at the Crescent Company, Pawtucket, R. I. They are **Kenneth R. MacLean** (sales) and **Louis F. Palana** (operations).

William J. Hegerty, executive vice president of the Colonial Iron Works Co., Cleveland, has been elected to a two-year term on the board of directors of the American Association of Cost Engineers.

James F. Lincoln, chairman of the board, Lincoln Electric Co., Cleveland, has been elected a senior board member of the National Industrial Conference Board for a term of three years.

continued on page 22

HARD FACING TIME CUT FROM 4 HOURS TO 25 MINUTES

The two end sections of this shaft have been built up with AMS 4775. Section at left applied by welding – time 4 hours; section at right by flame spraying – time 24 minutes, 45 seconds.

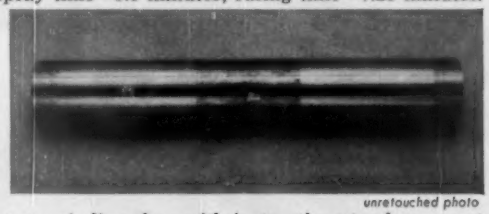
unretouched photo

QUESTION: And which end would you prefer to grind finish?

Here's the whole story. We took a 15″ length of 2.5″ mild steel shafting and undercut two 5″ sections .050″ on the radius. We then sent the shaft to a nationally-known job shop with instructions to apply AMS 4775 on the left-hand section, sufficient to finish at 2.5″. Weight of welded-on alloy was 17 9/16 ounces – time spent by one of their top men – 4 hours (including preparation).

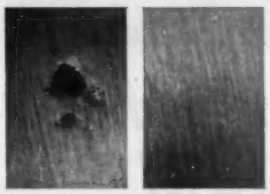
Then we blasted the second section with steel grit and flame sprayed it with AMS 4775 in powder form (ThermoSpray Powder 15E). The coating was then torch-fused. Weight of deposited alloy – 11 5/16 ounces; surface preparation, set-up and pre-heat – 12 minutes; spray time – 5.5 minutes; fusing time – 7.25 minutes.

Finish-ground shaft – welded section at left, flame sprayed section at right.



unretouched photo

We then sent the shaft out to a grinding shop with instructions to clean up at 2.500″ plus. The flame-sprayed section cleaned up at 2.510″ but welded section still showed pits when grinding was stopped at 2.477″ (see photos below left). Rockwell of welded end Rc-61, sprayed end Rc-60.



Note pits in welded section at left. Both magnified about 50x.

These flame-sprayed coatings are solid, homogeneous; usually superior to those applied by other methods. You can apply them at high speed, with lower material and finishing costs. In addition to AMS 4775, a number of other powders – including tungsten carbides – are available for various service requirements; all may be fused–some used as sprayed for certain service requirements.

For further information on this high-speed, money-saving, hard-facing process, phone, write or wire.

Pump plunger being flame sprayed with METCO ThermoSpray Powder Gun

METCO INC.
FORMERLY METALLIZING ENGINEERING CO., INC.
Flame Spray Equipment and Supplies

1179 Prospect Ave., Westbury, L. I., N. Y. Tel.: Edgewood 4-1900 Cable: METCO In Great Britain: METCO, Ltd., Chobham-near-Woking, England

METCO INC.
1179 Prospect Ave., Westbury, L. I., New York

Please send me free bulletin on hard facing.

Name _____

Title _____

Company _____

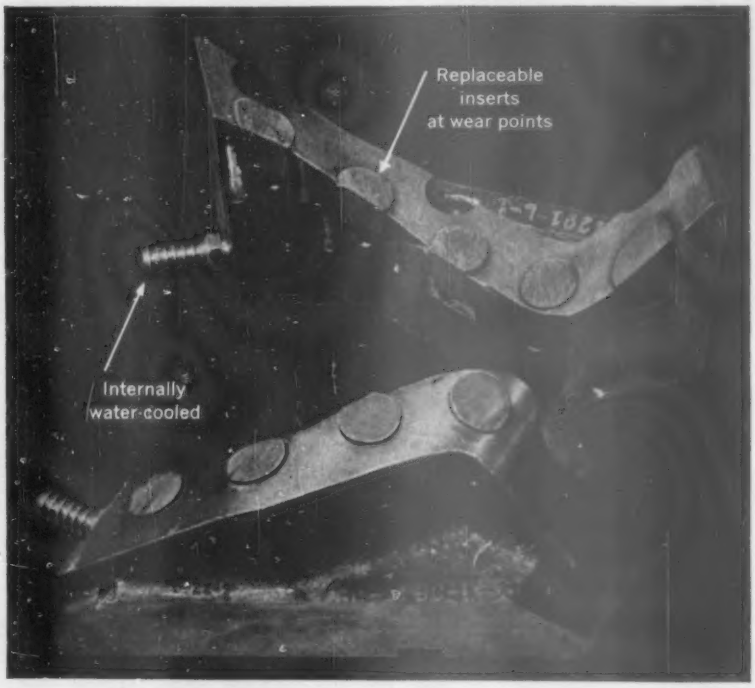
Address _____

City _____ Zone _____ State _____

For More Information Circle No. 51 on Reader Service Card.

AMPCO®

7 times longer life for projection welding die!



Replacement time and cost reduced almost 75%!

Originally, the projection welding die shown here was cast to contour in one piece and not internally water-cooled. Its life was short. Replacement was expensive, in terms of both money and downtime.

Then Ampco's experience was drawn upon. Working surfaces were changed to incorporate relatively inexpensive refractory inserts which could be quickly replaced. Adequate water-cooling was provided, also. These two factors vastly increased die life.

Ampco has complete facilities and the know-how for making welding dies of all types — flash, butt, projection, and cross-wire. Your Ampco-Weld distributor can put them to work for you. Call him. Write for Bulletin RW-10.

RW-28

AMPCO METAL, INC., Dept. 1778, Milwaukee 46, Wis.
West Coast Div.: Huntington Park, Calif. • Southwest Div.: Garland (Dallas County), Texas
For More Information Circle No. 7 on Reader Service Card.

MEN ON THE MOVE

continued from page 21

ELECTIONS:

FISHER

BROWN

Simon Fisher, president of National Electric Welding Machines Co., Bay City, Michigan, has been elected President of the Resistance Welder Manufacturers' Association. The Association's new vice president is **Harry V. Beronius,** sales manager of Swift Ohio Corp., Kenton, Ohio.

Richard K. Brown has been elected president at National Welding Equipment Co., San Francisco. He succeeds **Ernest L. Mathy** who has retired.

DEATHS:

VONIER

McELRATH

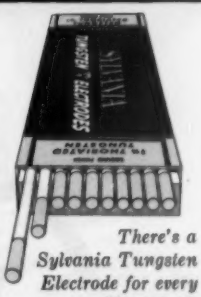
L. F. Vonier, veteran A. O. Smith welding executive, died recently in Milwaukee. He joined the firm's Welding Products Division in 1937 as general sales manager. In recent years he was a divisional sales consultant.

Thomas McElrath, Jr., 41, died late last year. He had been special project engineer for Linde Company's Electric Welding Development Department in Newark. McElrath joined Linde in 1941 after graduating from M. I. T.

warms up "cool" ideas

Close a deal for new, improved refrigerator tank cars and Tungsten Inert Gas Welding will help you hold the profit line. Low-cost, efficient TIG welding pays when you're welding ventilating ductwork, pipelines or hardware for outer space too. And for this kind of work, no finer Tungsten Electrode is made than by Sylvania.

Sylvania offers the most complete line of top-quality Tungsten Electrodes: Puretung®, Zirtung®, 1% Thoriated, 2% Thoriated. Each comes in the preferred finish—cleaned or ground, and color-coded to save you time and prevent costly errors. Chemical & Metallurgical Division, Sylvania Electric Products Inc., Towanda, Pennsylvania.



There's a Sylvania Tungsten Electrode for every welding need.

SYLVANIA

Subsidiary of **GENERAL TELEPHONE & ELECTRONICS**

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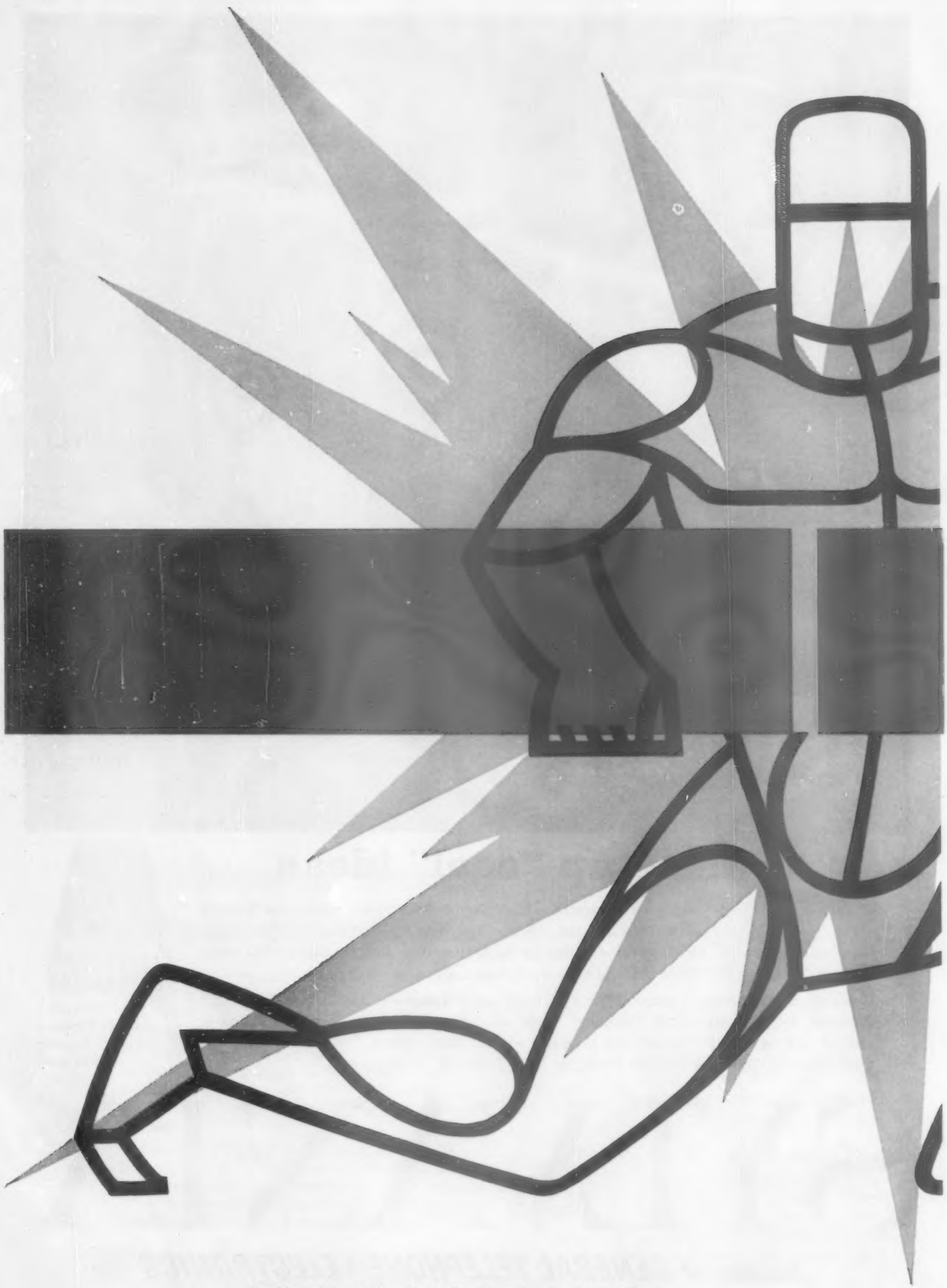

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COMBINES SUPERB WELDABILITY WITH EXTRA STRENGTH

N-A-XTRA

BEST LOW CARBON EXTRA-STRENGTH ALLOY STEEL YOU CAN BUY

When only the strongest steels will do, specify N-A-XTRA HIGH-STRENGTH. This low carbon heat-treated alloy steel is now available in minimum yield strengths ranging from 80,000-110,000 psi.

Along with this great strength, N-A-XTRA is readily formed and fabricated. It can be welded by any process. The most drastic welding tests on N-A-XTRA have shown no underbead cracking, even when plate temperatures are as low as —60°F.

Because N-A-XTRA is nearly three times stronger than mild carbon steels, it gives designers an opportunity to eliminate useless dead weight from finished products and realize substantial savings. Let us show you how N-A-XTRA HIGH-STRENGTH steel can do a job for you. Write Great Lakes Steel Corporation, Detroit 29, Michigan, Dept. WDF-7.

N-A-XTRA

GREAT LAKES STEEL

Detroit 29, Michigan

Great Lakes Steel is a Division of **NATIONAL STEEL CORPORATION**

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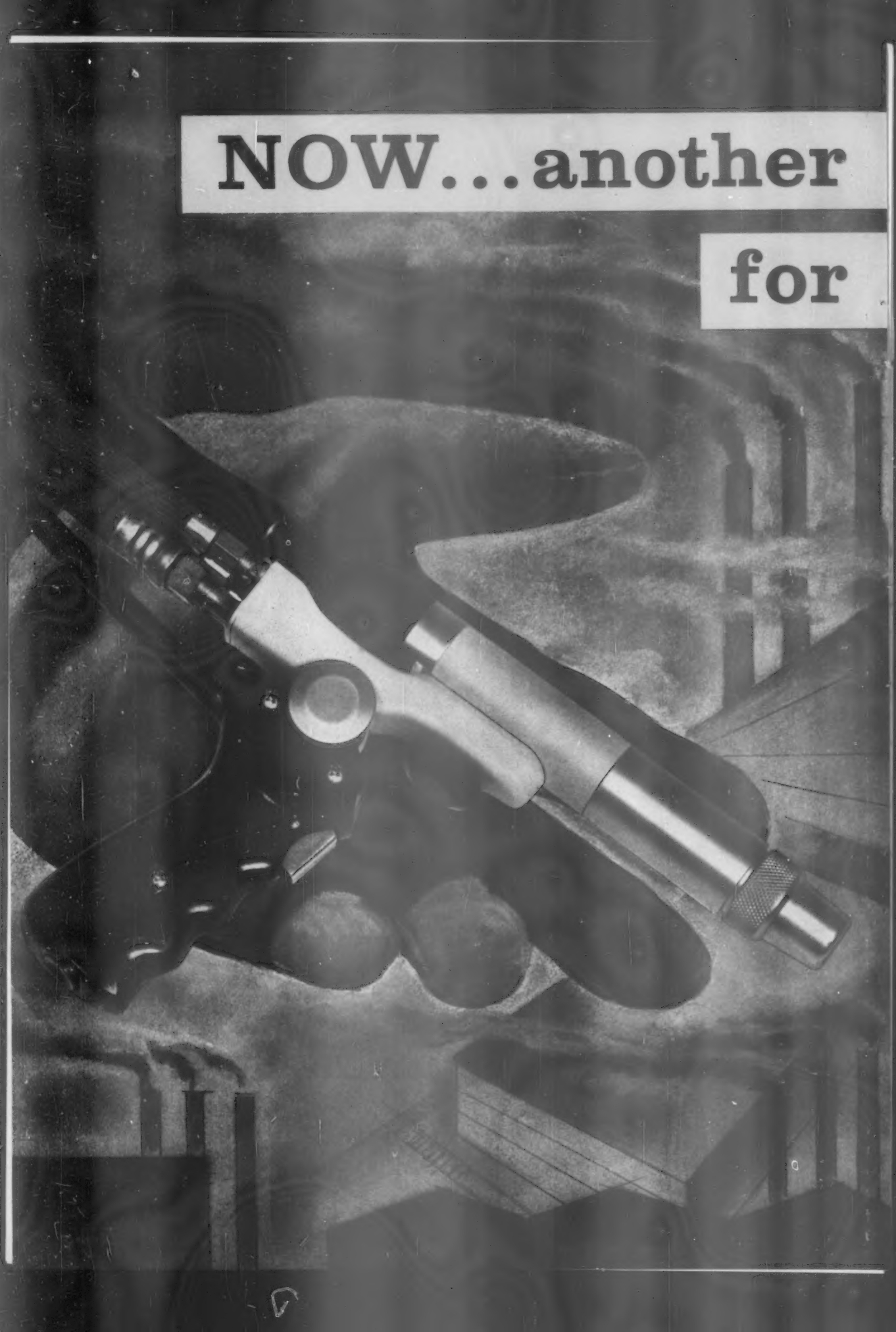
NOW...another

for



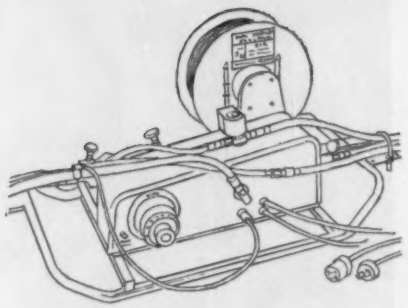
step forward

production welding

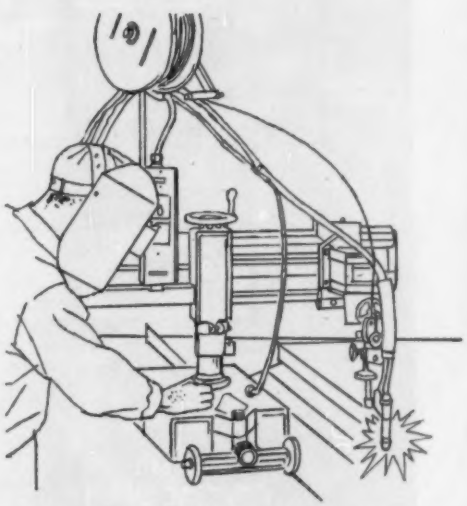
Progress means greater profits for you. The NCG AM-7 Gun for Automanual* welding is the newest, most improved consumable welding gun on the market. Its outstanding versatility, its low maintenance, its adjustable handle for welding ease and accessibility all mean increased production. And, it provides complete gas shielding using 25% less gas.

The multi-use barrel of the AM-7 Gun, designed for all MIG and carbon dioxide shielded welding processes, is interchangeable with the NCG A-10 Automatic Torch and may be used for all MIG, carbon dioxide shielded and TIG welding processes. And, for even greater versatility, a simple change of the guide tube accommodates ferrous or non-ferrous metals.

Send for complete information today. Ask for the new NCG Bulletin NH-142-E-3-B, NATIONAL CYLINDER GAS DIVISION OF CHEMETRON CORPORATION, 840 North Michigan Ave., Chicago 11, Illinois.
NCG sales offices, distributors and dealers in all principal cities.



The new WC series welding control units have features that were developed to meet field requirements. Designed for consumable electrode welding processes using argon, helium or carbon dioxide shielding gases, they provide maximum versatility and economy.



Multi-purpose barrel is interchangeable with the NCG A-10 Automatic Torch for MIG and TIG welding.

NCG®

NATIONAL CYLINDER GAS

Division of CHEMETRON *Corporation*

*NCG trademark for semi-automatic welding process and equipment

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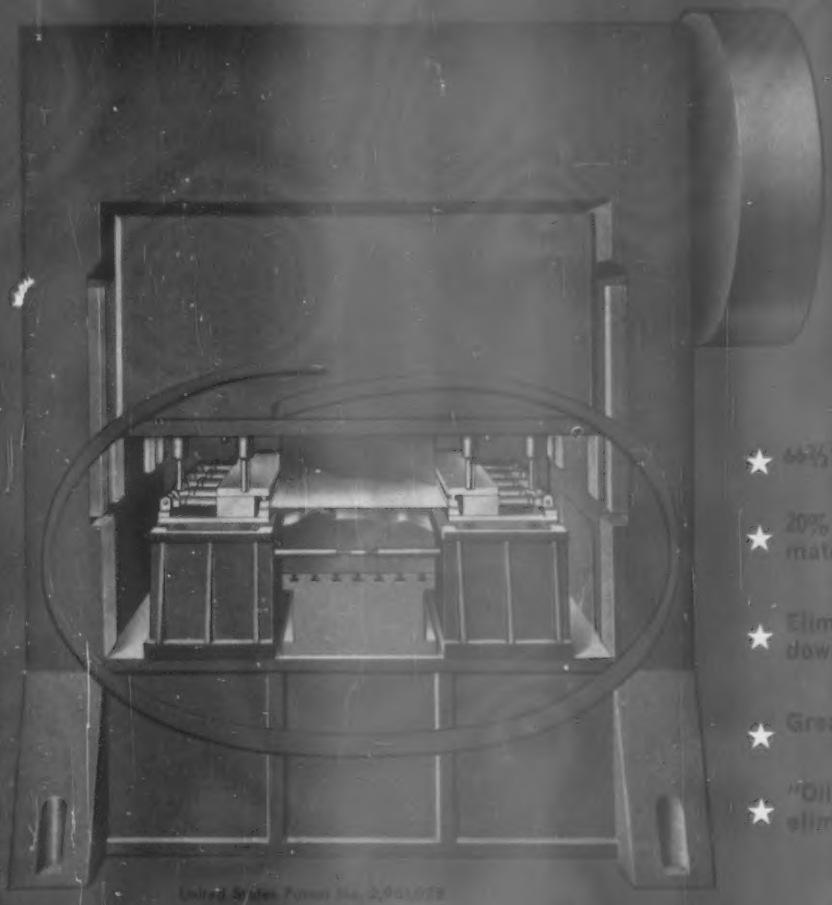
For More Information Circle No. 55 on Reader Service Card.

IT'S **NEW...** IT'S **REVOLUTIONARY...**

Stretch Forming and Standard Draw Press Work COMBINED!!



★ 66⅔% saving in die cost

★ 20% saving in sheet material cost

★ Eliminates the hold down ring

★ Greater Part Accuracy

★ "Oil Canning" eliminated

United States Patent No. 2,901,023

THE CYRIL **BATH** COMPANY

32370 AURORA ROAD • SOLON, OHIO

(LOCATED IN THE GREATER CLEVELAND AREA)

Manufacturers of Radial Draw Formers • Production Tool Press Brakes • Tangent Bending Segment Presses • Press Type Brakes • Special Machines

This new Cyril Bath, Tension Controlled Blank Holder, for shallow draw press operations stretches the metal sheet just prior to press forming. Pre-stretching makes the metal flowable or plastic like and parts are formed with extreme accuracy to the matching dies. Oil canning, wrinkles and trapped air pockets are eliminated. The hold down ring is completely eliminated so that die costs and scrap material is greatly reduced.

For Press users and potential Press buyers it is a must to investigate this new and outstanding development . . . Literature is available . . . write, wire or phone.

For More Information Circle No. 12 on Reader Service Card.

FEBRUARY, 1961
Welding Design & Fabrication
ESTABLISHED IN 1930 AS INDUSTRY & WELDING

THE WELDING FABRICATOR: a creative element in the growth of the welding industry

Introduction by J. DWIGHT EVANS, *executive director, Steel Plate Fabricators Association*

I HAVE VISITED most of the major steel plate fabricating plants in the United States and many in Canada. This is what I have found: The trend in plate fabricating is toward more complicated designs. This demands better welding procedures and automatic electronic equipment. Also, I have found that it is possible to use weldments economically now where they were unable to compete before. The advantages of welding have broadened the field of operations for our member companies in plant fabrication and field erection. The plate fabricating industry is growing in size and knowledge and is becoming more competitive.

The Steel Plate Fabricators Association, Inc. is the guiding force in this industry. It was organized in 1933 by twelve prominent fabricators who recognized the need of action on these objectives: Representation of the fabricating industry before government agencies; promotion of products fabricated from ferrous and nonferrous plate; cooperation with other industry associations in matters of common purpose; development of standards of performance for the industry; exchange of technical, statistical, tax, and safety information; organizing conferences for the study and solution of industry-wide problems; and publishing informative reports.

The Association has grown with the fabricating industry. Today we have a membership of 45, including the 12 founders. These members are the leaders in custom-built heavy plate fabrication, representing 80% of the production in this field.

The Association has many activities. One of them, a safety program, won us a National Safety Council award in 1959. Another activity is its statistical program covering shipments, bookings and backlog which keeps the members informed of current trends in the industry. Then, committees carry on programs through the year and report on them at the annual meeting. The Association also participates financially in research programs conducted by the Welding Research Council.

We look for even wider horizons in the fabricating industry in 1961. Naturally, we're pleased that the industry is so strongly represented by WELDING DESIGN & FABRICATION. We welcome this support.

J. DWIGHT EVANS became secretary of the Steel Plate Fabricators Association in 1946. He is the second to hold this important office since the founding of the Association. Mr. Evans, educated at Iowa State University-College of Engineering, came to the Association with a distinguished record. He was chairman of the Manufacturing Trade Group of the National Industrial Council; director of the American Society of Association Executives; and vice-president of the Association Executives Forum of Chicago. Evans, a colonel in the Army Reserve, served in both World Wars.

turn the page to learn how the fabricator stimulates and creates business . . . . .

THE WELDING FABRICATOR:

too many advantages to overlook

WELDING FABRICATORS are sitting pretty. They hold a sizeable lead over the iron foundries and forge shops in making parts for almost every industry. The reasons for this lead are clear:

- Weldment design is versatile.
- Weldments are stronger than iron castings.
- Weldments use less metal than castings and forgings.
- Weldments cost less to ship.
- Weldments need less machining.
- Weldments are economical to make. You can make one and save money, or make a thousand and save still more through production-line techniques.

The welding fabricator is creative. He helps a customer convert a casting into a weldment. He improves a weldment by careful application of process and use of material. The welding fabricator makes efficient, economical, and attractive parts from sheet, plate, bar, angle, and other structural shapes. He's equipped to the teeth and has a wealth of knowledge. In effect, the welding fabricator is the customer's manufacturing arm—but without a captive department's continuing overhead.

CLEARINGHOUSE FOR IDEAS

The fabricator is the clearinghouse for ideas on good design and the latest welding and fabricating processes. He's well aware of his customer's problems because he deals with the service requirements of many industries. He works closely with the customer's engineers, incorporating the best ideas into the product. He saves time, money and prevents grief, and the product is better for it.

What equipment and skill does it take to make a weldment? Does the average fabrication buyer have this equipment and skill? Can the buyer afford these things?

The progressive fabricator has a skilled, integrated organization. He designs, estimates, buys, manufactures, inspects. He can build large jobs or small ones, of exotic metals, high-strength steel or mild steel. He's equipped with about 35 classes of tools and equipment: positioning, lifting, cutting, bending, forming, heat treating, and welding. The average customer doesn't have the depth and breadth of skill the fabricator has.

Steel fabricators exist because their customers can't afford the high overhead that goes with producing economical fabrications. The customer has but occasional need for a cutting machine, a press brake, or a shear. And he can't amortize the cost of this equipment.

But the manufacturer can buy excellent parts made by the fabricator on the machines the manufacturer couldn't afford. The fabricator amortizes machine costs over many jobs. He can afford skilled, full-time workers. Every machine the fabricator buys increases his worth to the customer. Each new machine opens up the range of work he can do.

Some manufacturers make a percentage of their own weldments. They know that certain weldments would be too difficult or to costly to make in their own plant.

What gives the fabricator his big edge over foundries and forge shops?

First, the welding fabricator is thorough. Many fabricators comb industries—one-by-one—ferreting out hundreds of parts still made the old way. The fabricator proves his weldment will save space, time, material. He explains the versatility of a weldment: the ease of using different metals and thicknesses to gain needed properties.

The products of the foundry and forge shop are limited in sizes, and material. The metal in a casting is all one kind. If certain expensive properties are needed in one part of a casting, you pay the big price by giving the entire casting those properties. Castings can only be so big. Beyond a certain size, they have to be bolted together. Bolting presupposes flanging, and flanging means more metal and more machining. In fact, a lot of the metal that goes into castings and forgings comes off later in machining. And castings suffer from impurities, porosity, hard spots, and soft spots that make them weak and brittle and hard to machine.

FABRICATING STOCK: INSTANT QUALITY

The fabricator uses far better materials than the founder. They're wrought, uniform, sound, and strong. They're rolled to close tolerances. They're ever-ready bulk materials that the fabricator can quickly turn into a machine base, a pressure vessel, a shovel scoop, a glass-lined chemical tank, or one of a thousand things.

The fabricator buys materials in mill lots, cuts what he needs for one job, saves the rest for others. If the customer did the job he might lose 30 percent of the material as scrap.

The fabricator is at his creative best on a casting-to-weldment conversion. He shows the customer ways of improving his product: a thinner section here, a thicker one there, a spot of corrosion- or wear-resistance in the right place. His suggestions usually lead to a more compact, better looking product.

The fabricator gets products from drawing board to customer in a fraction of the time foundries and forge shops do. And he can change designs almost as fast as they are thought of. In contrast, it is costly to change the shape of a casting or forging. You have to modify patterns or dies or make new ones. In fact, it's so costly, casting users hold back on improvements so they can make several improvements at once. Meanwhile, a competitor using up-to-date welded fabrications is winning new customers.

Smart fabricators use up-to-date equipment and processes in making weldments. The fabricators that do quality work are usually the ones that get the repeat business when the bids are opened. No wonder the trends among fabricators are towards faster welding and cutting, better handling and positioning.

The fabricator's customers should be more conscious of quality work than ever before. The ones that still buy weldments on price alone will learn sooner or later that poor weldments damage their reputation and hurt their business. Today, the astute customer looks harder at the fabricator's reputation for quality than he does at price.

The fabricators aren't the only ones interested in converting castings and forgings to weldments. The people that make steel and the manufacturers of welding and fabrication equipment have a big stake in this work too. More and more weldments mean bigger and bigger steel shipments; and steelmakers are particularly interested in beating the concrete industry to the job. The more weldments the fabricators make, the greater is the market for welders, shears, press brakes, bending equipment, ironworkers, and many others. The fabricator is the hub of it all. • •

turn to page 32 for comments of leading fabricators

FABRICATORS MAKE THESE PRODUCTS*

A

Acetylene cylinders (tanks)
Aftercooler shells
Aftercoolers, steam jet
Air preheaters for boilers
Air receiver tanks, steel plate
Annealing boxes, pots, and covers

B

Baffles
Bails, ladle
Barometric condensers
Bins, prefabricated metal plate
Boiler shop products: industrial boilers, smokestacks, and steel tanks
Boilers: industrial, power, and marine
Boxes, annealing
Bubble towers, elevated
Buoys, metal

C

Cars, for hot metal
Chutes, steel plate
Columns, fractionating
Condenser boxes
Condensers, barometric
Condensers, steam
Cooling towers, elevated
Covers, annealing
Covers, floating: steel plate
Crane hooks, laminated plate
Culverts, steel plate
Cupolas, steel plate
Cyclones, industrial: steel plate
Cylinders, pressure: steel plate

E

Economizers (boilers)
Exchangers, heat: industrial

F

Floating covers, steel plate
Flumes, steel plate
Forms, collapsible: for tunnels
Fractionating columns
Fuel tanks, steel plate

G

Gas holders, steel plate
Gas tanks, steel plate
Gates, steel plate

H

Heat exchangers, industrial
Heat transfer dives (finned tubing)
Hoods, industrial: steel plate
Hooks, crane: laminated plate
Hoppers, steel plate
Housings, pressure
Hydro-pneumatic tanks, steel plate

I

Intercooler shells

J

Jackets, industrial: steel plate

K

Kettles, industrial
Knockouts, free water: steel plate

L

Ladle bails
Ladles, steel plate
Liners, industrial: steel plate

M

Marine boilers
Melting pots for metal
Mixers for hot metal

N

Nuclear reactors

O

Oil storage tanks, steel plate

P

Perforating on heavy metal
Plate work, fabricated: cutting, punching, bending and shaping
Pots, annealing, melting, and smelting
Power boilers, industrial & marine
Pressure vessels, steel plate

R

Reactors, nuclear
Retorts, industrial
Retorts, smelting

S

Scroll casings
Septic tanks, steel plate
Skid tanks, steel plate
Smelting pots and retorts
Smokestacks, boiler plate
Spheres, for liquids or gas: steel plate
Standpipes
Steam condensers
Steam jet aftercoolers
Steam jet inter condensers
Stills, pressure: steel plate
Storage tanks, steel plate
Surge tanks, steel plate

T

Tank towers, elevated
Tanks, calibrating: for measuring fluid quantities in the petroleum industry
Tanks for tank trucks, steel plate
Tanks, metal: glass lined
Tanks, steel plate: made in boiler shops
Towers: bubble, cooling, fractionating-elevated
Towers, tank: elevated
Troughs, industrial: steel plate
Tunnel lining, steel plate
Tunnels, wind

V

Vacuum tanks, steel plate
Vats, steel plate

W

Water tanks, elevated
Weldments
Wind tunnels

can you add your product to this list?

*1957 Standard Industrial Classification Manual, Bureau of the Budget

THE FABRICATOR sets his sights on tomorrow

VARGA

JOHNSON

AUSTIN

J. L. Varga, *general manager, Steel Fabricators Co.*: "Not all industries accept the fabricating industry as well as they might. A lot of industries (especially the small and medium size manufacturers in them) picture the fabricator as a blacksmith, or boiler shop operator. They're not aware of his abilities, facilities, and the savings he can bring them.

"It's really an educational void. High schools and colleges allude to welded fabrication, but they talk most about 'designing casting patterns to allow enough draft' or, 'how to detail a drawing for riveted construction.' To be up to date, schools should be teaching the versatility of plate fabrication and its many metals. The student ought to be learning how you can roll a big plate into a shell, weld on two ends, and you have a tank. He ought to know that the fabricator can take the same shell, weld a cone to the bottom, and voila, you've got a hopper. He should learn that you can cold-roll 6-inch plates into 60-foot-long vessels.

"It's been known for years that weld metal is stronger than the metal it joins. In spite of this, manufacturers still shy from welds in heavy plate. If they only knew it, the only *sure* way to get quality in a product, no matter how thick the metal is, is by fabrication. This quality is insured by the fabricator's up-to-date inspection methods: radiography, magnetic particle, fluorescent particle, ultrasonic, and hydrotest. Manufacturers ought to find out what the fabricator can do for them. For instance, they should learn what the fabricator can do in aluminum, and the other light and special metals. We think they will. In fact, we look for great expansion in the use of welded aluminum in the next few years.

"Fabricators have obligations too. We've got to analize costs and apply better engineering methods and standards to our work. We've got to reduce handling costs and make full use of our knowledge and equipment. An example: Our company prestressed beams on one job, then used the welding stresses to make the beams straight.

"There are quite a few fabricators that don't really know their costs. Until they learn them, they aren't helping our industry effectively compete with other construction methods. Oddly enough, the fabricators with fuzzy costing often short change themselves. They eventually become business statistics.

"The motto of an astute fabricator is: "Quality and service, at the best price." Following this rule assures the fabricator—in fact, all industry—business health."

Glenn L. Johnson, *plant manager, The Lewis Welding & Engineering Corporation*: "It's safe to say that people familiar with welding consider it to be the best way to make products. But how can welding be used to the best advantage?

"With today's filler metals and processes we can join many dissimilar metals. This opens new horizons to the design engineer. He can put special properties where they'll do the most good.

"New metals, and new processes for joining them, are being developed rapidly. Because of this, it is important that the fabricator's engineering department help the customer's engineers design their weldments, or if necessary design the whole job. This generally prevents poorly designed weldments. And no one benefits with poor design.

"Our company not only designs and fabricates weldments, we design and build special tools and fixtures to enable others to weld more effectively and efficiently."

J. B. Austin, *sales manager, Republic Structural Iron Works*: "The fabricator has an important position in industry. This importance will grow because many machinery and equipment manufacturers look upon him as an important economic tool—a valuable addition to his own facilities. Why? The fabricator does work for many industries, in many metals and designs. He's more experienced and better equipped for processing and welding than many manufacturers; the manufacturers find it more economical to farm their work to the fabricator.

"The first fabrications come by ones and twos. Today, automatic welding, better handling, better design, and greater use of jigs and fixtures has paved the way for production welding of many units of a kind, in many metals, and in all sizes."

turn to page 37 for typical fabrication-built jobs

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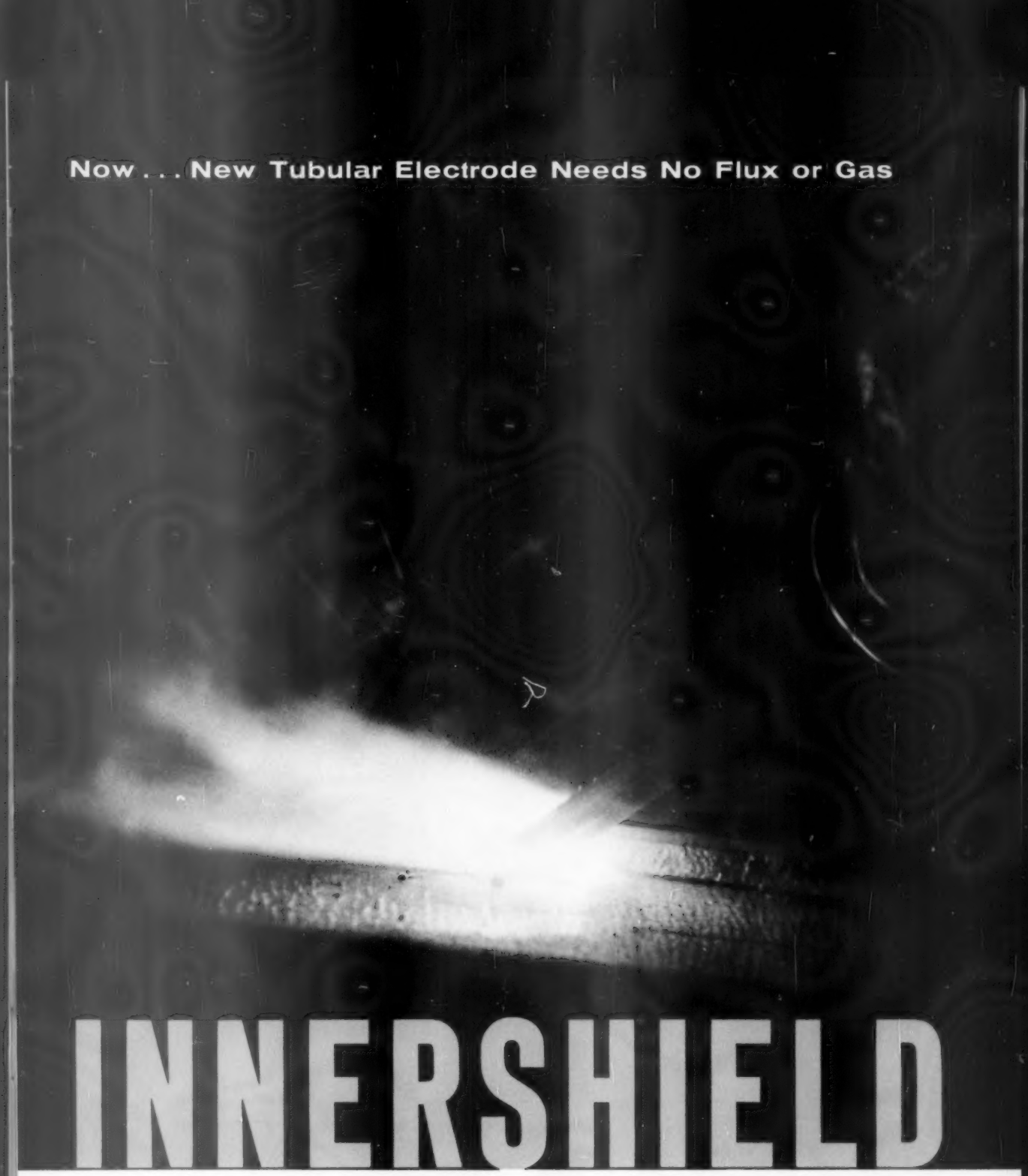


Now . . . New Tubular Electrode Needs No Flux or Gas

INNERSHIELD

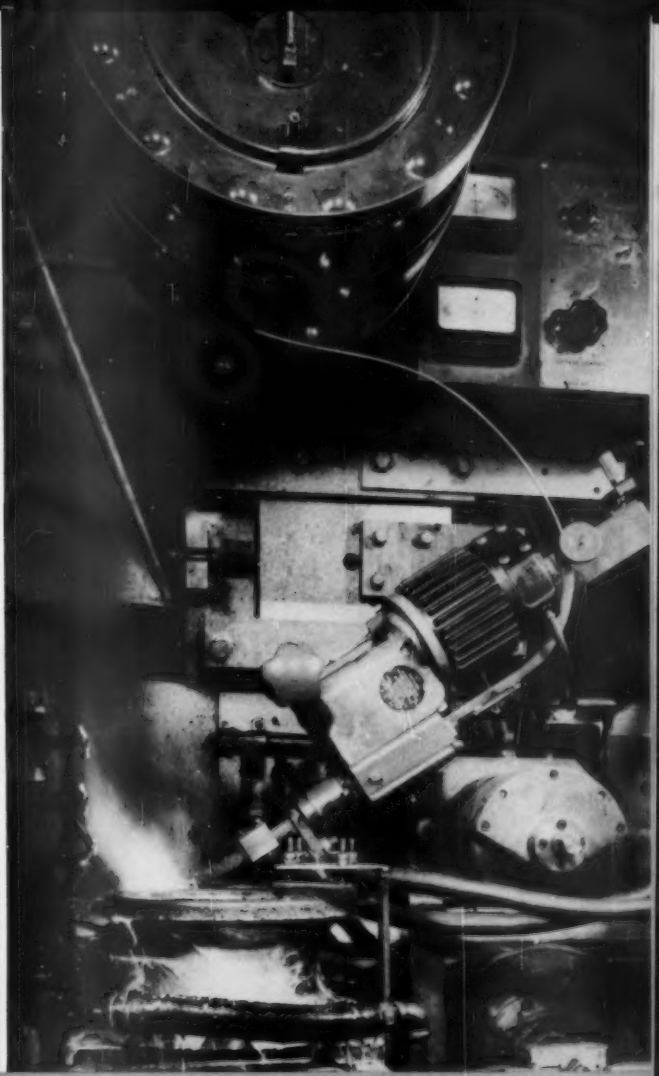
Lincoln's dramatic new welding process–Innershield–uses a special tubular electrode containing all necessary ingredients for welding–filler metal, arc shielding, deoxidizers, fluxes. Needs no CO_2, Argon or granular flux. Two new welders use it–a full-automatic and a semi-automatic called Squirt.

Welding railroad car cenier sills is easy, fast. The highly efficient, dense and chemically inert conical arc shield is virtually impenetrable by the surrounding air. Welds are sound, stronger than base metal. Visible arc lets operator follow joint easily. Speeds up to 50 ipm possible.

Innershield Squirt is ideal for short, intermittent, single-pass welding on parts such as these building trusses. Innershield electrodes bridge gaps caused by poor fit-up; medium penetration avoids burn-through. Excellent for diversified job shop operations.

THIS IS INNERSHIELD ON THE JOB

Because Innershield Squirt is flexible, easy to use, it replaces manual methods for welding small parts set up in jigs and fixtures. On this job, it increased welding speed by 150%, decreased slag cleaning time, and significantly reduced cost of finished parts.



Here, full-automatic Innershield makes continuous butt weld on 4-inch tubing at 120 ipm. Special electrode eliminates flux used in submerged arc process as well as manifold and piping systems needed for inert gas process. Reduces inventories, purchasing problems, storage space required.

Innershield Squirt is incomparably faster than manual welding both in deposit rate and arc speed. Deposition efficiency is an excellent 85% as contrasted with about 65% for hand welding, 50% for submerged arc. And because there's no stopping to replace electrodes, operating factor is extremely high.

Innershield Squirt is easy to use, too. Even an amateur can pick up the gun and turn out professional welds in ten minutes. We've illustrated (above) a few of the applications where Innershield Squirt is already on the job stepping up production, cutting costs . . . in the job shop as well as on high volume production lines.

See Innershield At Work

Somewhere near you there's probably a Squirt unit at work boosting production, cutting costs. Why not have your Lincoln Field Engineer show it to you? Send in the attached postcard today. And, for a complete description of the Innershield process, available electrodes and both semi-automatic Squirt or full-automatic equipment, ask for your copy of Bulletin 5300.1.

HERE'S THE GUN THAT LETS AN AMATEUR TURN PRO

Pull the trigger, strike the arc, and you're welding faster than ever before. This gun, made of tough molded plastic, needs no water cooling, is light in weight, and is easy to handle. You have to try it to believe how easy it is to make tough, sound welds . . .fast!

MN-1—RUGGED, COMPACT INNERSHIELD SQUIRT WELDER

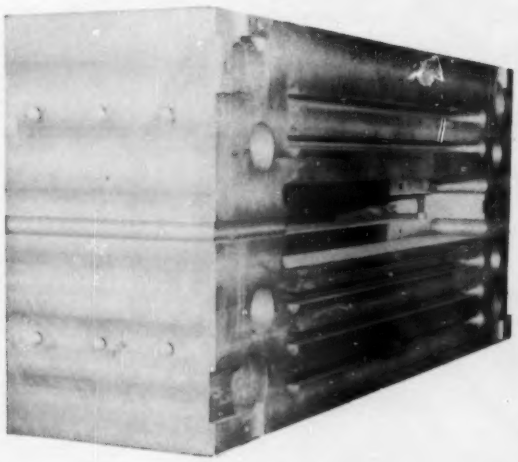
Here's a compact, sturdy unit designed and built to hold up under rough on-site conditions. It's not finicky. Put it to work in your shop, shipyard or production line, now! Comes complete with wire feed mechanism, wire reel, input and output cables, gun and controls.

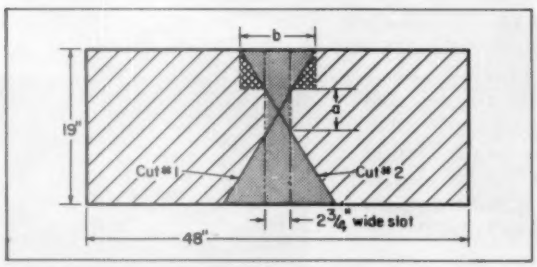
LINCOLN WELDERS

THE LINCOLN ELECTRIC COMPANY
22801 St. Clair Avenue
Cleveland 17, Ohio

CASE HISTORIES

proof that the fabricator improves products and speeds delivery



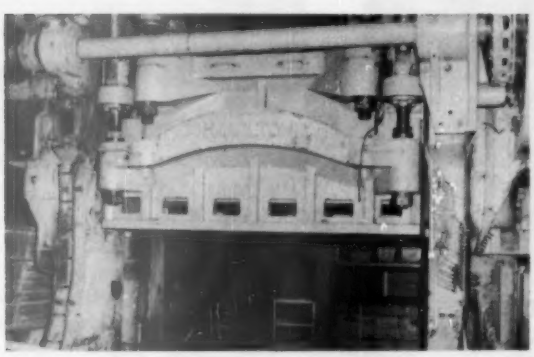


KEY TO ECONOMY in making the bolster (above) was to flamecut the dropout slot. Sketch shows steps: 1—cut center slot; 2—angle torch to produce exact hole depth (a) and well width (b) in two cuts; and 3—machine well to dotted line.

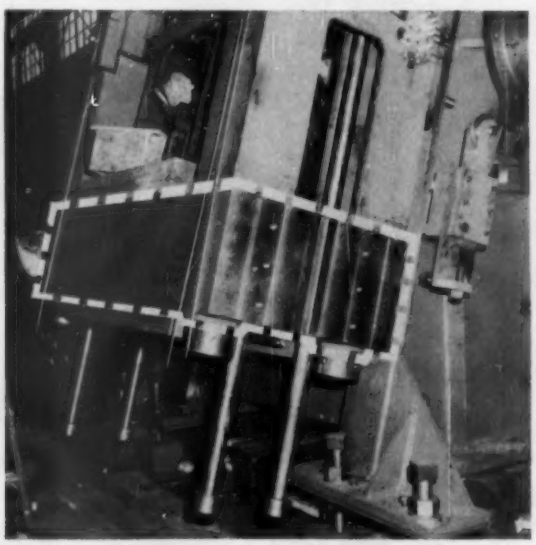
FOUNDRIES COULDN'T GUARANTEE CASTING quality on a tremendous cold extrusion press bolster, so Barth Corporation, Cleveland, flamecut it from a billet. The customer also specified weldments for structural parts of the 400-ton press. They didn't want castings. Castings would have required half again as much metal as the weldments to provide the same strength. Also, castings would have been costly and bulky to ship.

The 16,000 lb. bolster measured 19 inches by 4 feet by 7 feet. Had it been made in two halves, the slug dropout slot machined half from each part, and the two parts Thermit welded, the cost would have been tremendous. Instead, the slot was quickly flamecut from one billet. It was cleverly done by angling the cutting torch (see sketch) so that two cuts did 80 percent of the work.

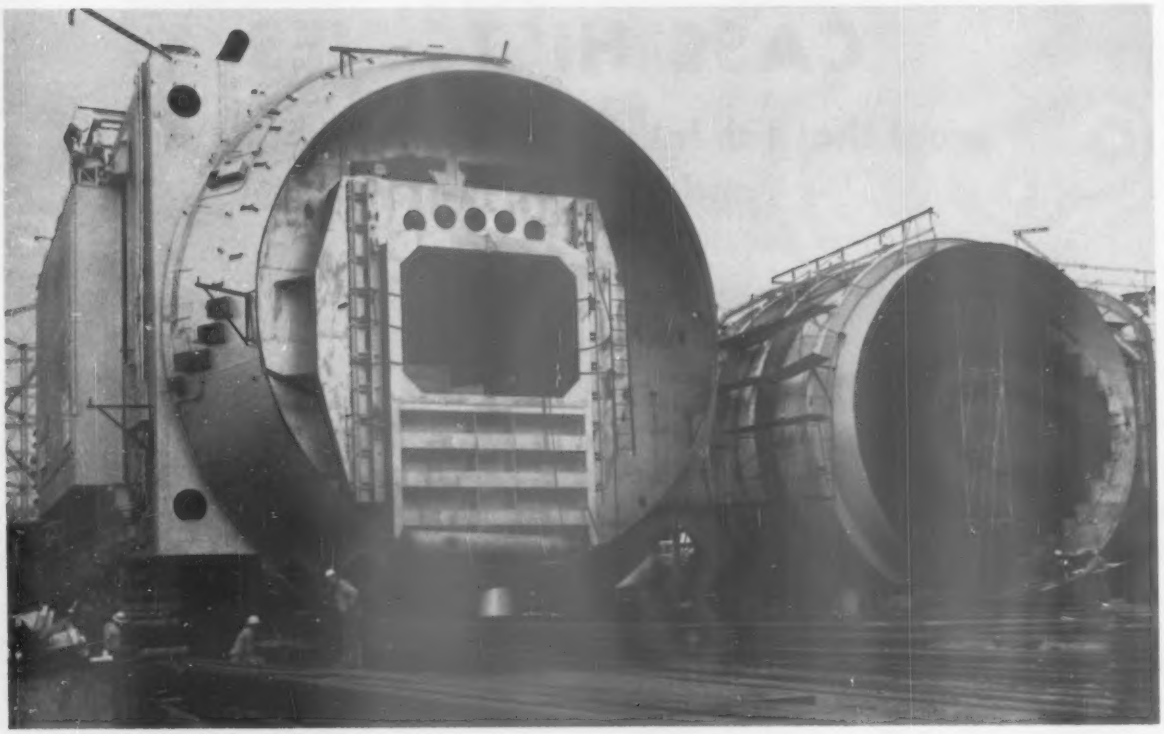
case histories continue on next page



OLD WAY: Cast construction made this 800-ton press the size it is. Foundation work alone cost about $12,000. Once this press is set, it's usually set for life.



NEW WAY: This unique, 400-ton extrusion press is self contained. Resting on pads (no foundations needed) it goes anywhere the floor will support it. Bolster is outlined.



FABRICATED PLATE was the only way to build a job this size. This wind tunnel's airlock section (above) contains 950 tons of structural and plate steel and miles of sound welds. Job was built in sections, field erected. The tunnel will be used to make tests under simulated flight conditions at speeds up to 1,400 mph.

BEAUTY, SIMPLICITY, UTILITY are found in this 500,000-gallon Waterspheroid which is 125 feet high. There's no end to the versatility of welded design for structures like this; and strength is always assured.

DISSIMILAR METALS (Type 430 flange and a 4130 sleeve) were welded. They gave the Barth Corp. opposite grain flow and prevented defect leaks through a 0.060" missile motor flange seal.

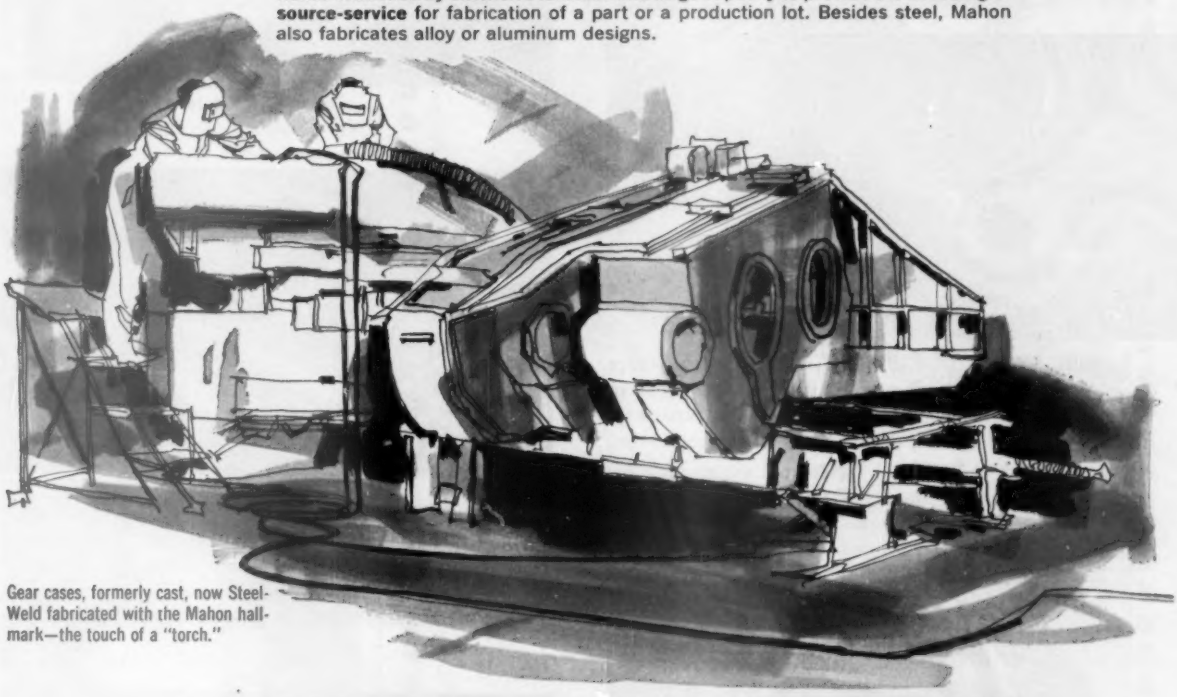
THIS BASE COST LESS as a weldment than a casting pattern itself would have cost. Republic Structural Iron Works, Cleveland, saved their customer a lot of weight and machining, yet gave them greater strength.

turn to page 40
for more case histories

MEN WHO KNOW
FACILITIES, CAPACITY
AND **EXPERIENCE,** BUY...

"fabrication by Mahon"

Unmatched experience . . . from fabricating hundreds of thousands of parts of all types, both mechanical and structural . . . has sharpened old-time craftsmanship into a modern production art, uniquely applied by Mahon's Steel-Weld Division. No matter what kind of fabrication—welding, machining, or assembling—your parts might require, Mahon's experience is yours at **no extra cost.** This depth of experience is backed by extensive facilities and large capacity to provide the best **single-source-service** for fabrication of a part or a production lot. Besides steel, Mahon also fabricates alloy or aluminum designs.



Gear cases, formerly cast, now Steel-Weld fabricated with the Mahon hallmark—the touch of a "torch."

Non-destructive radiographic inspection insures highest quality work by Mahon—Master of Metals.

WRITE TODAY FOR NEW STEEL-WELD LITERATURE . . . OR, FOR ON-THE-SPOT HELP, DISCUSS YOUR DESIGN REQUIREMENTS WITH A MAHON FABRICATION ENGINEER

THE R. C. MAHON COMPANY • DETROIT 34, MICHIGAN

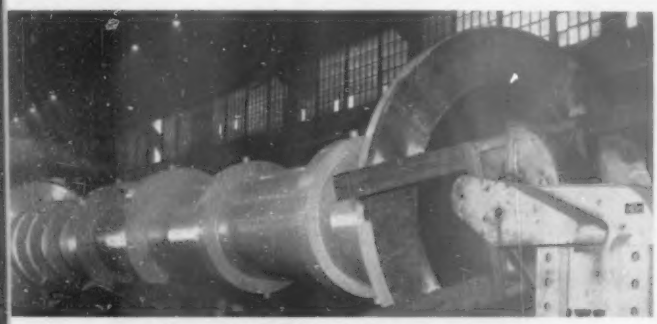
Manufacturing Plants—Detroit, Michigan and Torrance, California

Sales-Engineering Offices: Detroit, Chicago, New York, San Francisco and Torrance

MAHON

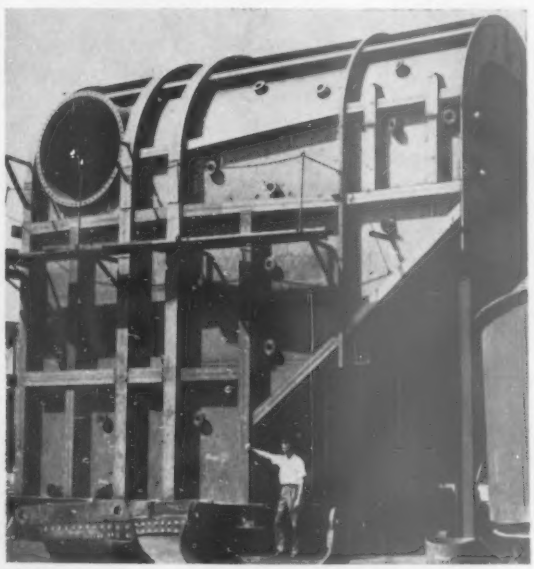
For More Information Circle No. 47 on Reader Service Card.

COMPLEX FABRICATIONS like this large oil heater are a sign of the times. This one was built in the Pacific Northwest because oil and gas pipelines now extend there. This is new business for fabricators and it's made possible by the versatility and the economy of welded fabrications.

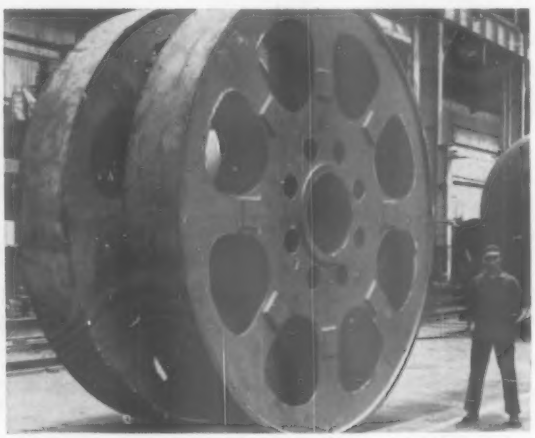


FABRICATING EQUIPMENT, like this positioner and truck-mounted idler rolls, plays a vital role in making economical weldments. Republic Structural Iron Works, Cleveland, couldn't have built this 45-ton, 60-foot-long vessel without them.

THIS IS ONE of 300 aluminum beds fabricated for a diesel engine manufacturer by Republic Structural Iron Works. Each bed weighs over 2 tons, is 22 feet long, and is built to close tolerances. Republic used the fast consumable electrode process to speed welding.



STEEL MILLS BUY A LOT of welded fabrications. Hibben and Company, Chicago, built this spark box for McLouth Steel Corp., Trenton, Mich. Hibben fabricated this job in their plant, match-marking sections and knocking them down for shipping.



FABRICATED GEAR BLANKS have it all over cast ones. They are stronger, cost less to build, and less to ship. The cost of a pattern for this gear would have been prohibitive. And, how would you store and maintain the pattern?

NO QUESTION OF CASTING this gigantic, high-pressure feed water heater. But the job took the fabricating skill of Griscom-Russell Co., Massillon, Ohio to carry it off. For instance, the stationary head section of the feedwater heater was so thick, it took 100 submerged arc passes to fill up the weld cavity. The company paid particular attention to weld joint design.

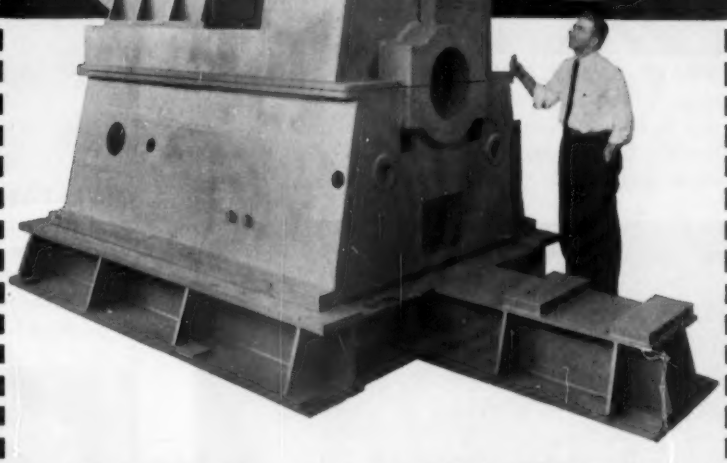
Griscom-Russell x-rayed the multi-pass joint as they went along. Finally, they x-rayed the girth weld completely, then stress relieved the whole assembly.

A FABRICATION FIRST was rung up by Chicago Bridge & Iron Co., Chicago, when they built this first commercial size titanium-clad pressure vessel. And the structure, built for a West Coast petro-chemical firm, has proved itself over many months of strenuous service.

In cracking the titanium-clad barrier, CB&I has opened the door to the fabrication of other petro-chemical vessels, and those used in paper and other processing industries.

Fabricating Precision Saves 25% to 35% of Secondary Machining Costs

....on this Steel Mill Shear Housing Assembly



Most heavy weldments are fabricated with 3/8″ to 1/2″ excess material to allow for secondary finishing operations. Here at Steel Fabricators Company, we work to 1/8″ to 1/4″ allowance! Figure what that can mean to you in terms of savings on machining and scrap loss!

Take the 5-piece shear housing assembly for automatic steel mill lines which is shown above. We built 6 of them. The work involved developing intricate sections, cold forming 1″ plate (we can cold form anything up to 7″ thick), and cutting 12″ plate (we can flame cut up to 24″ plate). The gear housing sections on top were kerosene tested to assure oil-tight seams. The total weight of the assembly was about 9 tons (we can handle 15 ton weldments).

Yet the workmanship on these units was so precise, with the parts matching so accurately, that the manufacturer not only saved 25% to 35% of the usual machining costs, but he also was able to use the component parts interchangeably!

Our operators are currently doing Certified Armor-plate welding and fabrication... as well as arc welding of aluminum and alloys.

To find out how such quality workmanship can save you money, write today for a FREE brochure describing the range of work and facilities available at...

THE STEEL FABRICATORS COMPANY

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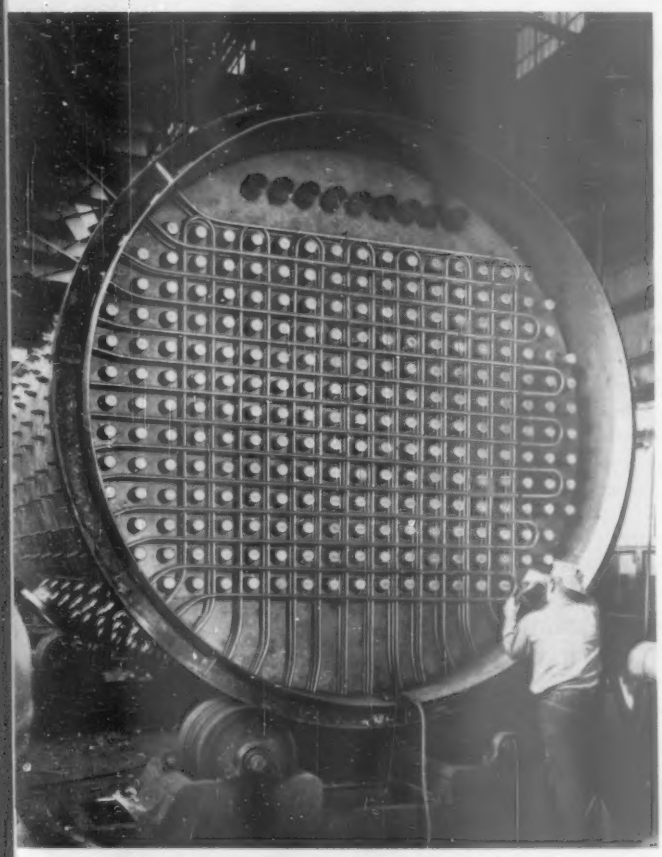
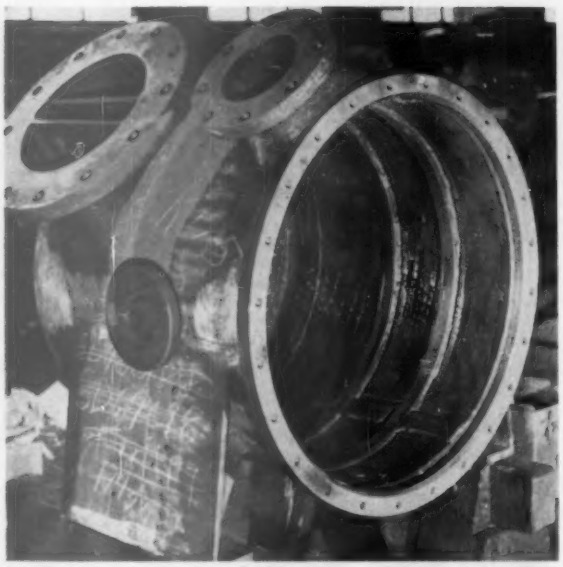
SMART FABRICATING techniques save time and money. The fabricator didn't roll the shell and bars of this compressor case separately and gamble on fit-up trouble. Instead, he welded them flat and rolled them all at once.

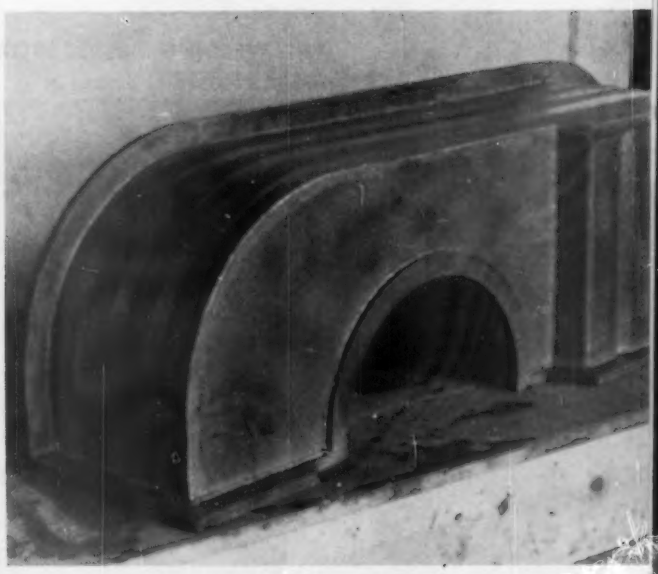
THE LARGEST CLAM-SHELL BUCKET ever fabricated in the South illustrates the versatility of welded design. It was built for Mall, Inc. by Yaun Manufacturing Co., Baton Rouge. The 24,000-lb. bucket can pick up 18 cubic yards in one scoop.



STAINLESS STEEL (165,000 pounds of it) went into this unusual 68-foot long, 11-foot diameter column. Besides the large amount of plate material that went into the vessel, thousands of feet of stainless tubing were used. The fabricator used heavy-duty turning rolls to turn and position the job for assembling and welding. Stainless steel is only one of many metals a fabricator works with.

WHAT'S IN A TANK? Photo (above, top) shows reinforcing plates for diesel fuel tanks used on railroad refrigerator cars. The fabricator, Blackwelder Manufacturing Co., Rio Vista, Calif., punched the 7-gage hot-rolled steel sheets and welded them with argon shielding for cleanliness. The fuel tanks (above, bottom) are getting close inspection to see they are dimensionally correct.





THESE ARE TWO EXAMPLES of what a fabricator can do.

The compressor case weldment (left) once would have been cast in one piece, probably in cast iron. This one is economically built of a dished head, rolled rings, rolled plate, and cast steel nozzles. To make it at the lowest cost, the fabricator used manual, semi-automatic, and full automatic arc welding. At first, he flame cut the rings from plate. Later, he used roll formed ones. Now, he rolls bar stock and welds it either by automatic arc welding or by flash welding.

The sheet (11 gauge) steel housing (right) replaced a cast iron housing with ¾-inch-thick walls. Corrugations made in flat sheet which is rolled to shape give increased strength and stiffness, meaning quieter operation and less vibration.

Settling filter chamber fabricated of SA-302 manganese moly. steel to operate at 2400# pressure and at 1200°F.

50 YEARS EXPERIENCE IN DESIGN AND FABRICATION

Equipped with X-Ray apparatus and stress relieving furnaces

- High pressure water tube boilers; heat exchangers and pressure vessels to code or specification.
- Hoppers, bins, stacks, ducts, tanks or any steel plate fabrication.
- Erection or installation at your site.
- Estimates given on turnkey or sub-contract basis.
- Maintenance and repair crews available.

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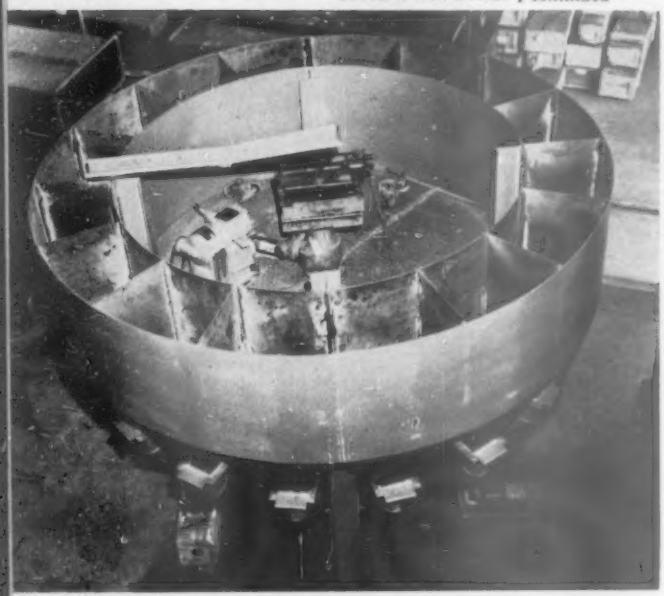
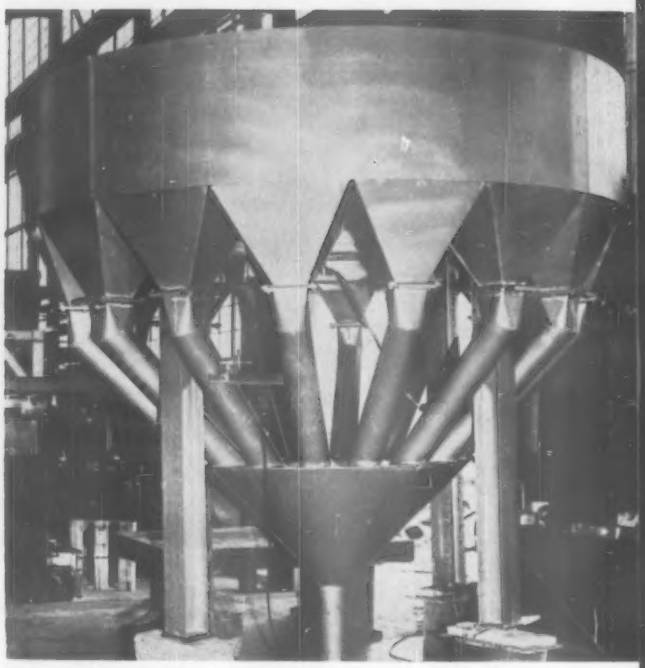




MAKE US A MIXER for remixing titanium sponge. That's what a contractor asked of Heltzel Steel Form and Iron Co., Warren, Ohio. The contractor had to furnish and install facilities for remixing titanium sponge at a titanium mill. The sponge settles into about 16 different sizes (from fine to coarse) during shipping to the mill and must be remixed before it is charged.

The contractor gave Heltzel only sketchy details. He wanted two units. The sponge should be fed by a revolving, vibrating chute into 16 different compartments. Gravity then would feed the sponge down through 16 tubes into a collecting discharge hopper, yielding a homogeneous mixture. The contractor gave Heltzel only the approximate overall height and diameter.

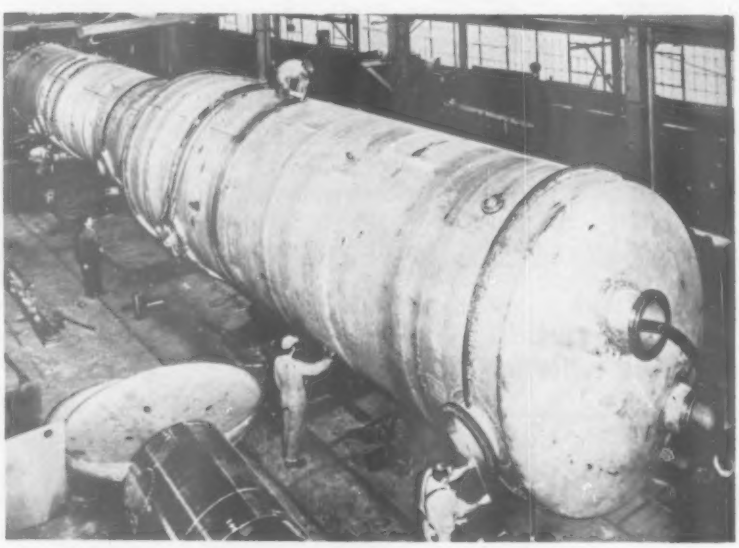
Heltzel designed this unit, probably the first of its kind, using welded mild steel.

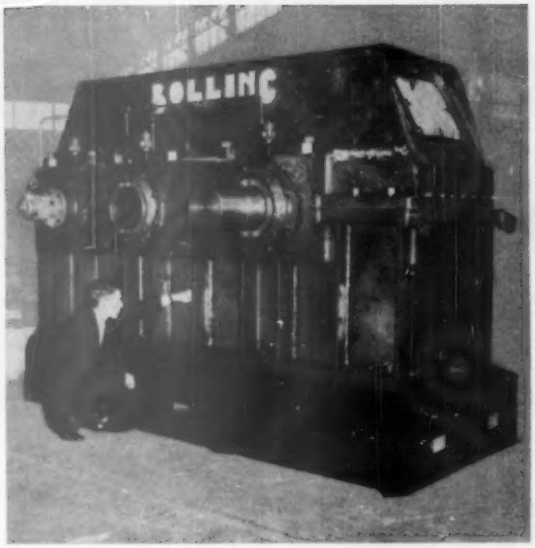
They had onlv 120 days to do the job. First, they had to submit their design and details to the contractor for approval, wait for this approval, and then do the job.

THE LARGEST distillation column of its kind built in this country was fabricated in Cleveland, Ohio, by Colonial Iron Works Co. The column weighs 50 tons, is 80 feet long, and 12 feet wide. It's so big it had to be shipped in two sections.

The all stainless distillation unit has a rectification section made entirely of Carpenter 20, a high-alloy stainless. This section required special fabricating techniques to meet critical tolerances.

Valued at $200,000, the column contains stainless steel sieve trays for purification of chemical process streams in the manufacture of synthetic fibers.



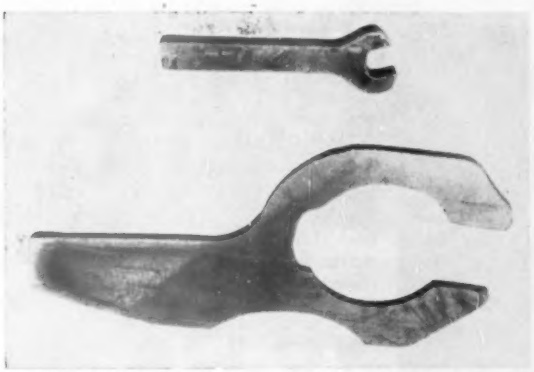


FABRICATORS ARE USUALLY CAUTIOUS about telling customers how to design their products. The customer usually knows what he needs in strength, structure, and space.

But occasionally, Apex Welding and Fabricating Corp., Bedford, Ohio, feels obliged to tell the customer if the design is overwelded. Many design engineers do not yet recognize the strength produced by the deeper penetrating processes such as CO_2. Smaller fillets suffice.

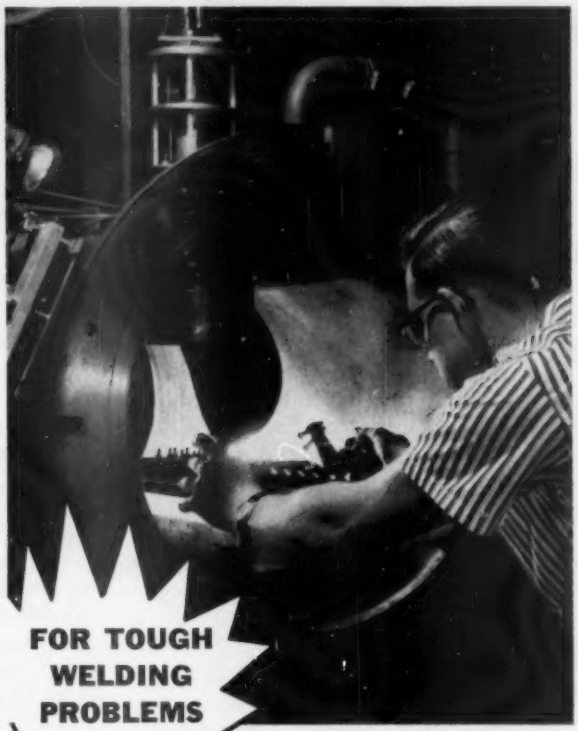
Another thing, weldments save time and money over castings. On large speed reducers, for example, the case can be welded in the time it takes to build the patterns.

Apex built two such reducers for the Stewart Bolling Co., Inc., Cleveland. Assistant Editor Bob Anderson points to one in the photo. Apex delivered the stress relieved and sand blasted units in four weeks—the time it would have taken to build casting patterns. This is the kind of service that often spells the difference between getting or losing a good size order.



CUSTOM WRENCHES and similar hand tools are made with unusually close tolerances and fine surface finishes by Reliable Steel Plate Co., Cleveland. The wrenches and tools are flame cut in production quantities at less cost than forgings or castings.

NEW Complete... Welding Facilities



FOR TOUGH WELDING PROBLEMS

Rosemount Engineering Company announces the installation of a 36" chamber Electron Beam Welder in its Welding Department. REC's certified welding facilities include:

- Electron Beam Welding—from .003" foil to .500" plate —including exotic metals such as beryllium, molybdenum, tungsten and zirconium
- Tungsten Inert Gas Welding
- Metal Inert Gas Welding
- Aircomatic Gun—permits rapid deposits of wire for distortion control
- Stake Seamer—for controlled arc penetration and accurate positioning of parts

WELDING SERVICE AVAILABLE—REC's welding engineers provide consultation and establish welding procedures for difficult problems on an R and D basis. REC's welding facilities are available for production work on an hourly or piece basis. Write, wire or call if we can be of service on jobs requiring broad R and D or production experience.

REC

ROSEMOUNT ENGINEERING COMPANY

4900 West 78th Street • Minneapolis 24, Minnesota

For More Information Circle No. 61 on Reader Service Card.

55,000

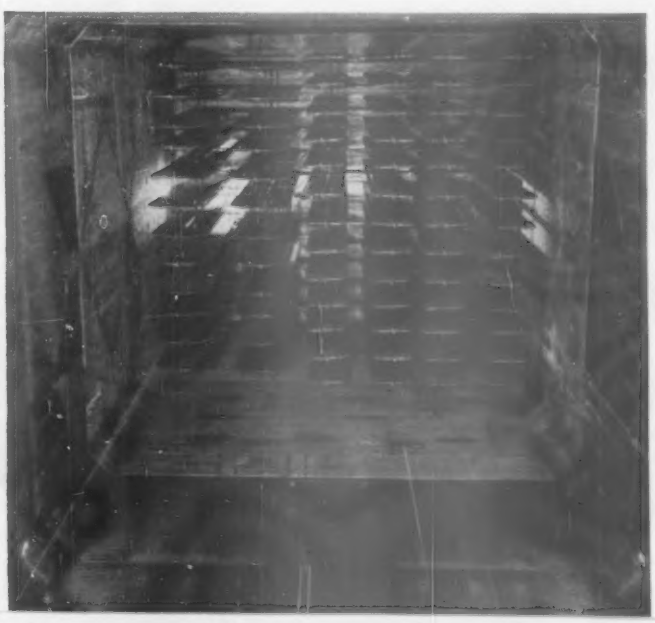
HIGH STANDARDS AND QUALITY ELECTRODES FEATURE CONSTRUCTION OF WORLD'S HIGHEST PRESSURE STEAM GENERATOR.

The Eddystone Station of the Philadelphia Electric Company is a milestone in power station engineering and operating efficiency.

Situated on the banks of the Delaware River south of Philadelphia, Eddystone is the first power station in the world designed to produce steam at the supercritical pressure of 5,000 pounds per sq. in. and a temperature of 1200° F. This breakthrough in the commercial generation of electricity is expected to set a new world's record for power station efficiency by producing a kilowatt hour from 2/3 pound of coal.

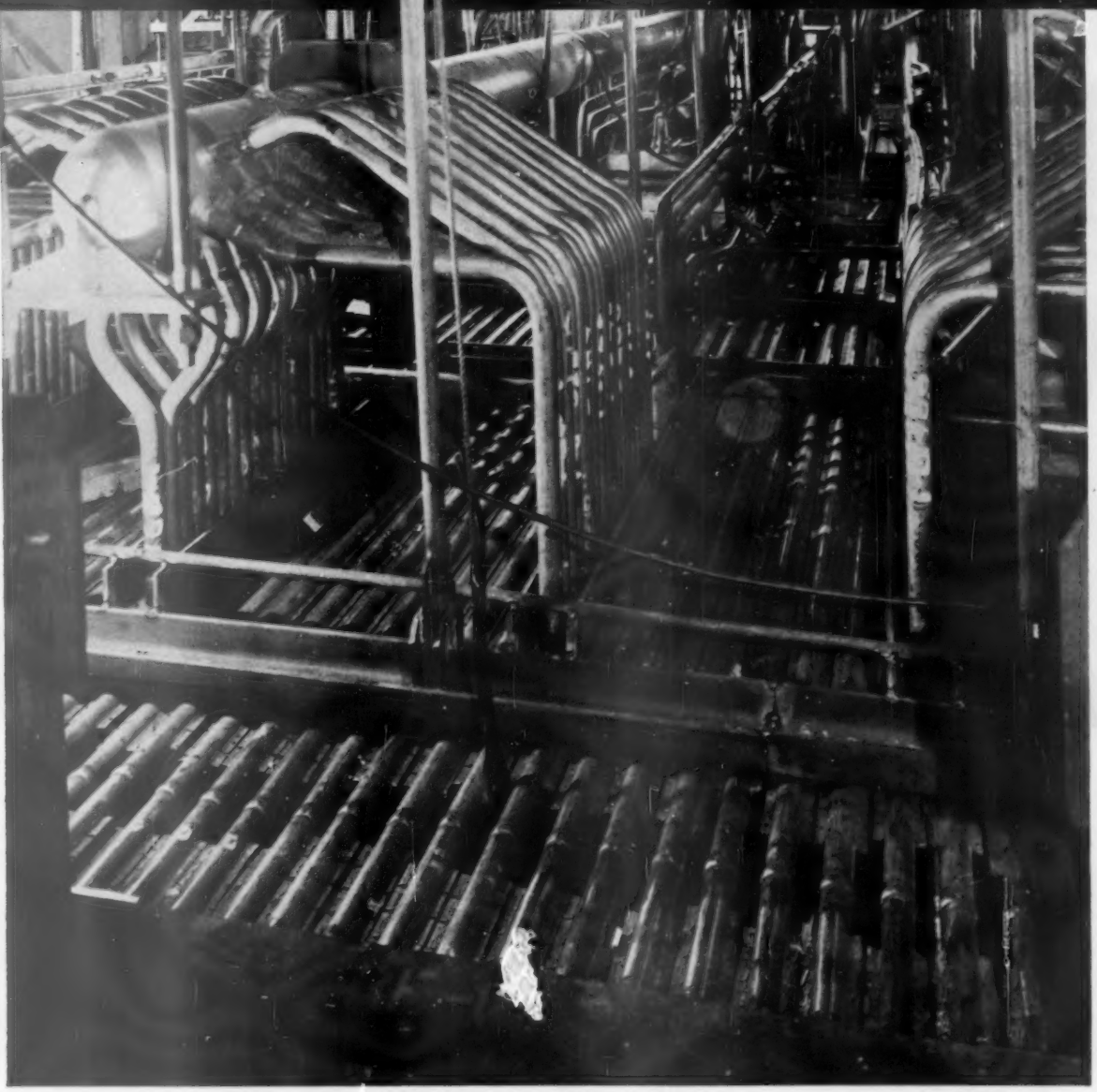
55,000 welds were used to fabricate the hundreds of miles of tubing and piping used in the construction of the steam generating unit. Approximately 25,000 of these were field welds made at the construction site. The extreme operating pressure and temperature necessarily required unusually high weld metal quality and reliability from the electrodes selected. For the field welds, Combustion Engineering, designer and manufacturer of Eddystone's No. 1 boiler, specified Arcaloy types 316 and 347 stainless steel electrodes for the chromium-nickel material, Atom-Arc 8018CM and 9018CM iron powder low hydrogen electrodes for the chrome-moly grades and Atom-Arc 7018Mo for the carbon-moly grades. Continuous visual inspection was conducted as all welding proceeded. Dye penetrant and X-ray inspection of welds were used throughout the erection of the boiler. When the boiler had been completely welded, it was hydrostatically tested at 8,000 psi. pressure. All of these tests and inspections failed to show one defective or leaking field weld.

These dynamic results mirror the experiences of many leading fabricators throughout the country. Like Combustion Engineering, they have proven conclusively that X-ray quality weld metal of Alloy Rods Company electrodes increases the efficiency of their welding operations. They have learned from experience—you can profit from their experience. Specifying your electrode requirements from our extensive line of quality alloy arc welding electrodes is the one sure guarantee of satisfaction. Alloy Rods Company, York 1, Pennsylvania.



The steam producing heart of the station is a C-E Sulzer Monotube Steam Generator, designed and manufactured by Combustion Engineering. This unit is 12 stories high, 100 feet across, and 75 feet from front to back. 170 miles of all-welded tubing and piping, low-chromium and chromium-nickel material, went into the unit's fabrication.

WELDED JOINTS HYDROSTATICALLY SOUND



ALLOY RODS COMPANY

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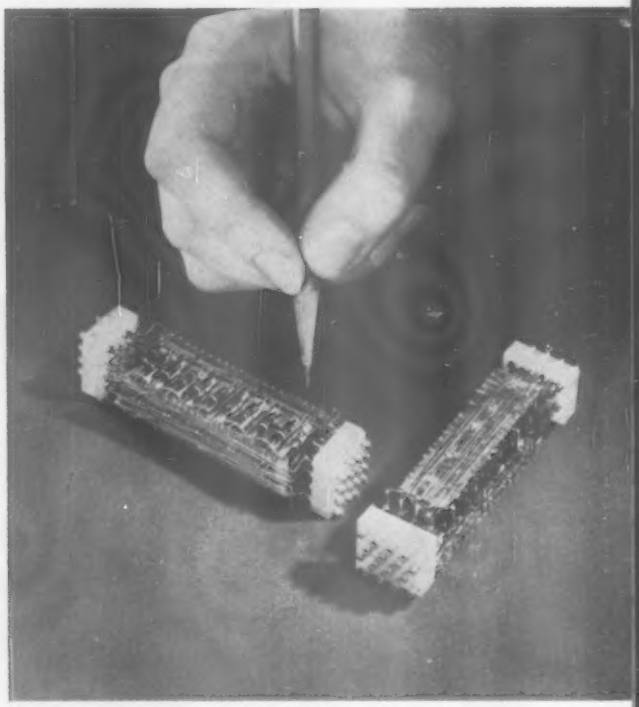
TWENTY YEARS OF LEADERSHIP IN THE DEVELOPMENT OF QUALITY ALLOY ARC WELDING ELECTRODES

For More Information Circle No. 4 on Reader Service Card.

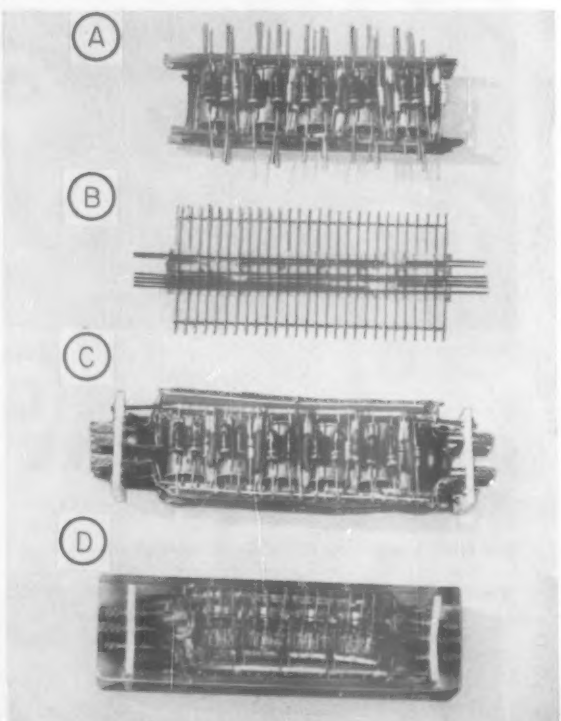
Electronics industry miniaturizes



PRECISELY PROGRAMMED welding sequence (above) protects delicate components from excessive heat as logic wiring is welded to a stick.

OVER 300 WELDS PER CUBIC INCH (above, right) are made possible by optimum layout and logic wiring. Components are packed tightly in actual physical contact; bus wiring connects all repetitive sections of the circuit.

FOUR STEPS in the construction of a welded assembly (right) are from top to bottom:
A: The stick assembly.
B: The logic wiring.
C: Assembled module.
D: Finished potted module.



by **ARTHUR FRANCIS MENTON**
Servo Corporation of America, Hicksville, New York

with dense welded packaging

IN BRIEF: Stored-energy resistance welding replaces soldered connections and permits packaging components at twice the density thought possible previously.

MINIATURIZATION is still a challenge to the electronics industry. Many advances have been made: printed circuits, transistors, more efficient assembly. Depending on whose figures you accept, the size of an average black box filled with electronic components has been cut from 20 to 50 percent every year for the last five years.

However, connecting components remained a big obstacle to higher density packages.

THE PROBLEM

It is true that printed wiring has greatly reduced connection space, but a soldered connection, at best, must be 1/8 to 1/4 inch from the component. This fact can easily double the volume of a package.

Instead of waiting for smaller components, several manufacturers decided to try to help themselves. They now pack tried and proved components at twice the previous density.

THE SOLUTION

The approach is a novel one, called 3-D or dense-welded packaging. It consists of mounting standard miniaturized components, tightly together, in a 3-dimensional mass. The leads are then joined by stored energy resistance welding. After inspection, the whole unit is potted, making a rugged, reliable, high density package.

Many organizations have found it more practical to construct the dense-welded package in the form of sticks. You can easily stack sticks into other shapes. A typical stick consists of several subunits. These are jonied by accurate jigging and precision welding.

The many components in a package call for a vast amount of connecting wires. The problem is minimized by using a mesh of logic wiring. This logic wiring consists of layers of fine wires, insulated from one another at the weld points. One mesh on either side of the stick provides for best component layout, tack weld points, and power bus interconnections.

THE RESULTS

Dense-welded packages eclipse earlier methods by avoiding soldered joints. Lead wires for soldered connections must be long enough to dissipate the heat that might damage components during soldering. Precision stored-energy spot welding avoids this hazard, eliminates extra-long leads.

Special welding problems arise because the leads vary in size and are made from different metals. This is overcome by using a common lead-joining material, flat nickel ribbon, which allows a variety of connections to be made with one setting of the welding equipment. We look for component manufacturers to produce special items in the near future that have easily weldable leads.

Several companies are trying to find out which lead material is the easiest to weld. Nickel, stainless steel, and Dumet are being considered. Copper can be welded, but it is not easy—particularly if it is coated with a thin residue. • •

EDITOR'S NOTE: This article is based on material originally published in MACHINE DESIGN *Magazine. Photographs were furnished by Raytheon Corporation.*

Why spot weld?

High densities . . . 200,000 components per cubic foot; best soldering methods yield only 100,000.

Small investment . . . after brief operator training, price per package competes strongly with standard methods.

Reduces assembly time . . . faster than manual assembly of printed boards.

Cleaner, trouble-free connections . . . no need for special surface preparation.

Less error . . . failure rate of soldered connections is 1 in 50,000; that of welded connections is 1 in 100,000.

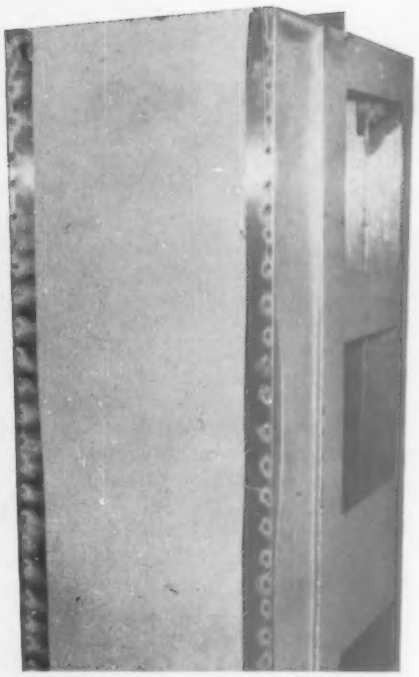
Compact welding set-up . . . equipment is easy to maintain and has simple controls.

Why not spot weld?

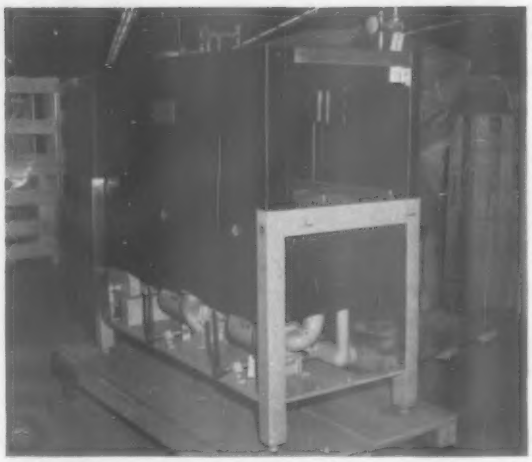
Many jigs and fixtures are required for assembly.

Faulty parts are difficult to replace because welded joints are permanent.

Automatic welding:



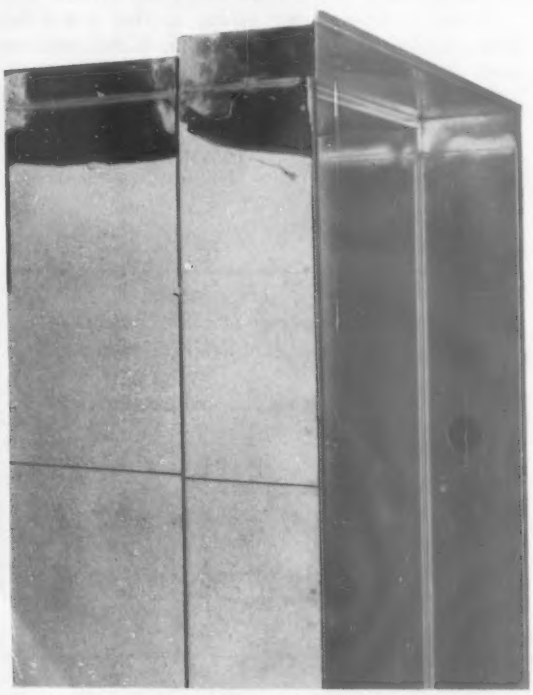
OLD WAY took hundreds of metal-distorting tacks that called for fussy straightening, and pounds of solder to fill and fillet the seams.



PRODUCT: Food scraps can't breed bacteria in this dishwasher; design has eliminated scrap-trapping crevices.

IN BRIEF: Commercial dishwashers are stronger, look cleaner, and wash cleaner now that automatic welding has replaced expensive soldering.

NEW WAY eliminates long seam welds; sides and bottom are made 1-piece by bending. Ends are butt welded to tank body on automatic unit that will do eight sizes.



THE SANITATION CODE makes no bones about bacteria-breeding crevices in dishwasher tanks. It says simply: None.

We build commercial dishwashers, so we must pay particular attention to tanks, where crevices are most likely. In fact, we've filled crevices so carefully, it's costly. We make tanks of polished 16-gage type 302 stainless steel. Stainless won't rust and it cleans up like new. We make tanks 41, 66, and 103 inches long. They're all close to 2 feet wide.

OUR OLD TANK: GOOD BUT COSTLY

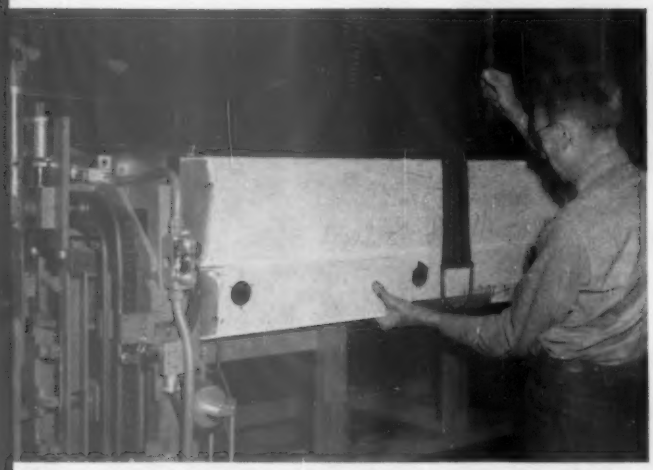
We used to join tank sides and bottoms with tungsten arc tack welds—one every two inches. Then we'd tack the ends on and weld them all around. Finally, we'd go inside and solder every seam. This made good dishwasher tanks, but it was slow, and it was expensive.

TOO MUCH HAND-STRAIGHTENING

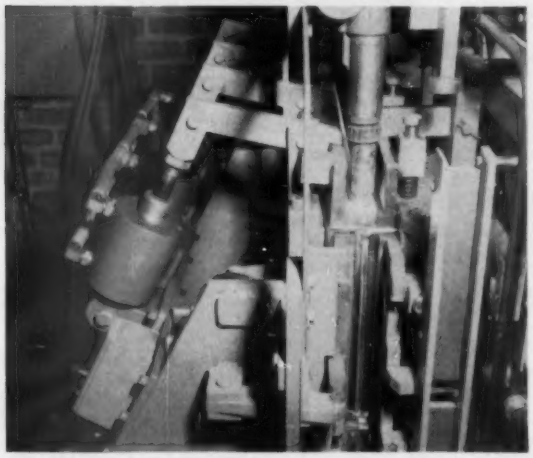
A 103-inch tank needed about 200 tacks, 12 feet of continuous welds (on the ends), and had 35 feet of crevices to solder. It wasn't enough, by the way, to fill the seam with solder. We had to put a generous fillet in the corners to make them easy to clean. Not only was tacking and soldering slow work, but the heat of the many tacks distorted the tanks more than we liked. Then we had a lot of fussy hand-straightening to do to make the tanks look good.

better tanks with half the work

by **JOHN DEVOLDRE**, *Toledo Scale Corp., Rochester, N. Y.*



ADJUSTABLE TOOLING on the welder accomodates eight tank sizes. Paper prevents damage to the stainless sheet.



WELDING: Clamps butt tank ends and body tightly as torch welds up one side, across top, down the other.

OUR NEW TANK: BETTER IN EVERY WAY

So we met with a builder of automatic inert arc welding equipment to see what kind of an automatic welding machine he could build to do the job. Then we redesigned the tanks for automatic welding. When planning crystallized, we had a machine that would weld the tanks for all eight of our dishwashers. Furthermore, it would do it with far less welding, less distortion, and with most of the scrap-catching corners gone. The automatically welded tank would be stronger than its predecessor, and best of all it wouldn't have to be soldered.

OUR NEW DESIGN

We avoided welds on the long seams by eliminating the seams. Method: we made the sides and bottom one piece, bent the sheet on our press brake.

We designed the tank ends to butt the main body. This required very accurate bending, but further eliminated corner food traps.

With the new welder, we've practically no human variability in tank welding. The machine has an inert arc torch that follows a rod track along the welding seam. The torch moves hydraulically through a chain drive. When the tank body and end piece are put into the machine against line-up stops, the edges are clamped snugly together with hydraulic clamps against a water-cooled copper backup bar. Then we tack the assembly in three or four places to keep the pieces from moving. Finally, we weld the seams with the automatic welder.

We use 125-amps, argon gas to shield the weld, and run the torch at 16 ipm. We do not use filler metal. The torch welds up one side of the tank, across the top, and down the other side. We stop the arc at corners, resume welding after passing the corners. Later, we weld the corners by hand.

EARLY BUGS SOON IRONED OUT

When we first used the machine, we couldn't keep the torch on the welding seam. This meant stretches of imperfect weld. We decided we needed to beef up torch tracking. We did it by adding another track so the torch wheels could run between them.

Our chain-driven torch is maneuverable. We can advance it, back it up, start it or stop it, anywhere along the welding seam. We can move the torch in and out so that we can weld in any plane within its several-inch adjustment. This is good, not only for present tank designs, but it will give us design room on future tanks.

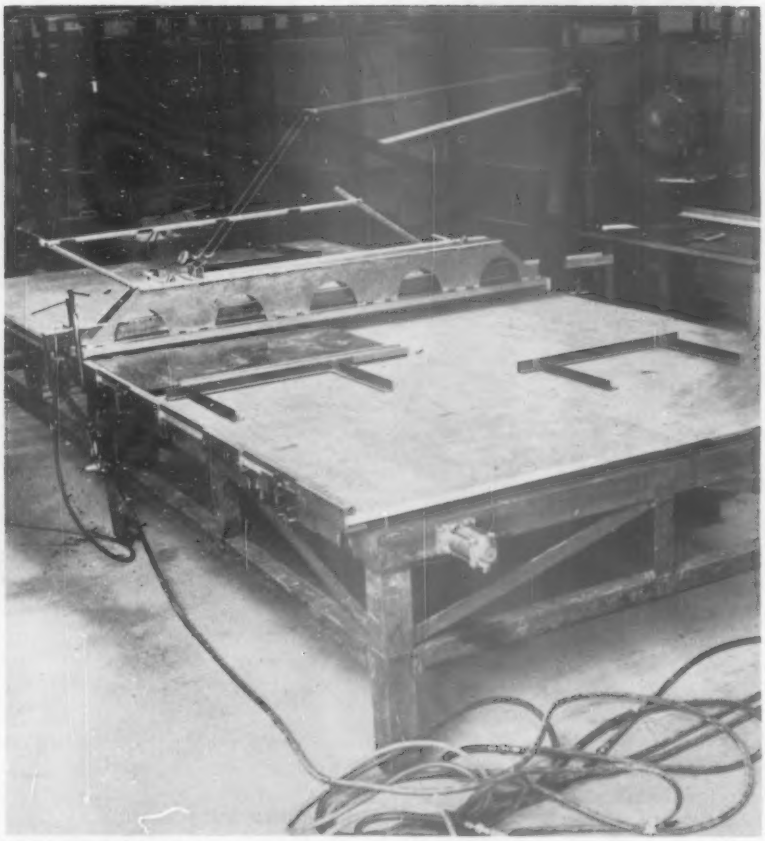
SHEARING AND BENDING MUST BE ACCURATE

As you might expect, we have to shear and bend accurately. The tank body has offsets on each side. The ends must butt the tank body exactly on three sides to get uniform welds in this light-gage material.

We do our punching and shearing on a 300-ton hydraulic press. We use a mechanical press brake for bending. We use interchangeable tooling for punching and notching.

After we weld both ends of the tank on the automatic, we hand weld the corners. Then we wire brush the corners. We had a lot of grinding to do when we tacked and soldered. Finally, we give the seams a clean bill of health by soap-testing them with an air jet.

With automatic welding, we've cut our labor in half and eliminated the costly solder. Our dishwasher tanks are stronger, straighter, and better looking. • •



THIS EQUIPMENT is used for thermal-fusion welding of polyethylene on a production basis. After strip heater melts edges and causes them to flow (right), they are forced together with a pressure of about 2 psi.

Techniques for welding polyethylene

by **W. Q. HULLINGS** and **J. L. McDANIEL**, *Convair, A Division of General Dynamics Corp., Fort Worth*

IN BRIEF: Convair tried three welding methods before it found one that was satisfactory for fabricating shields for nuclear-powered aircraft.

WE HAD TO FIND A WELDABLE MATERIAL to shield the crews and components of nuclear-powered aircraft from radiations. After tests, we chose polyethylene containing 6% boron by weight.

HOW WE CHOSE POLYETHYLENE

The hydrogen in polyethylene is the best neutron attenuator. The boron helps attenuate the neutrons without creating secondary gamma rays. It does not affect the physical properties of the polyethylene.

HOW WE CHOSE A WELDING METHOD

We tried three different welding methods before we were satisfied. These were:

Hand torch welding: The boron caught fire when we put a direct flame on the polyethylene. This caused too much oxidation and gave us questionable welds.

Hot-gas welding: This method worked, but it was too slow and too expensive. [Editor's Note: In this process a hot inert gas is passed through a hand-held torch to heat the sheets. A filler rod joins the sheets when they are heated.]

Thermal-fusion welding: This is the process we settled on. A strip heater heats the plastic. A thin silicone coating on the heater's aluminum shield keeps the polyethylene from sticking. We heat sheets to about 270°F. The edges touching the heaters start to flow. Then we remove the heater and force the two sheets together with a pressure of about 2 psi. We cool welded sheets before they are formed. • •

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SHORT ARC

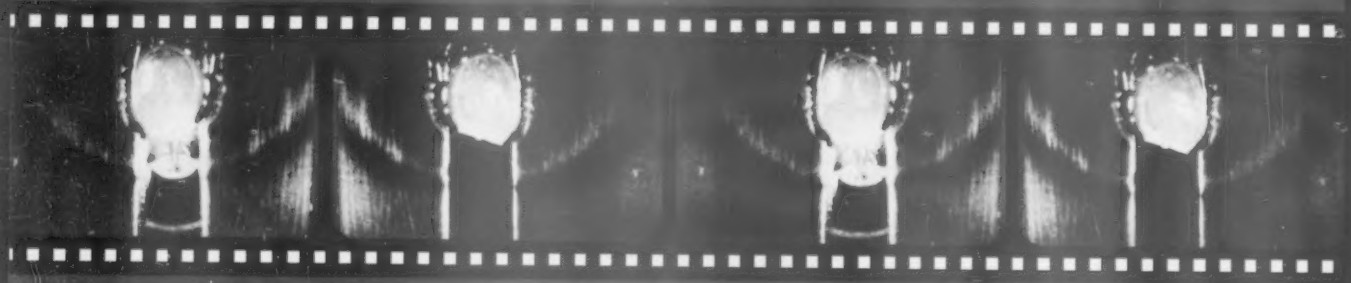
QUALITY SHEET-METAL WELDING

Sheet-metal welding has been *possible*, but quality welds were difficult and time-consuming. Now, LINDE's new Short Arc process—combining specialized power source characteristics, shielding gas, and semi-automatic torches—easily delivers *quality* and economy

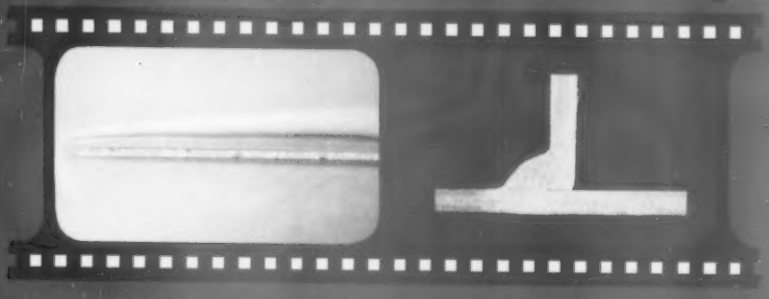
- . . . on all sheet-metal thicknesses
- . . . with minimum distortion—far less than any other process
- . . . tolerating more than 100% gaps—even ¼-in. gaps on ⅛-in. material
- . . . producing 30 ft. of fillet welds for only a pound of wire and four cubic feet of gas
- . . . as fast as 20 inches per minute on 16-ga. sheet
- . . . as easy to control as a ball point pen
- . . . permitting all-position welding with the same settings
- . . . and *consistently* cleaner, smoother, more-uniform welds than any other process.

See the next page for details.

SHORT ARC



Here is a typical LINDE Short Arc weld in the making...



a finished bead, and a weld cross-section...

Notice the intermittent "shorting," the smooth, finished bead, the uniform penetration. No spatter. No clean-up. No finishing. Welders trained in minutes. Short Arc employs precisely controlled, low-voltage pinpoint-arcs shielded by an argon-CO_2 gas mixture. Shorting the arc lets the puddle cool, *minimizing* heat distortion and *controlling* burn-through for ideal penetration. Short Arc works on all common metals and their alloys, on carbon steel, stainless, aluminum and magnesium...on all types of joints...in all positions.

Only LINDE has brought together the ideal combination of materials for welding sheet metal—the SVI-300 power supply, with variable slope, voltage and inductance controls that permit an *infinite* range of settings; the C-25 argon-CO_2 gas mixture that combines with variable slope to reduce heat and *control* penetration; and the ST-2 and ST-4 torches, specially designed for hard and soft wires respectively. There is no substitute for Short Arc. Only LINDE offers the specialized equipment that makes such *quality* sheet-metal welding possible. For more information or a live demonstration, call your nearest LINDE office.

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LINDE COMPANY

UNION CARBIDE

Division of Union Carbide Corporation
270 Park Avenue, New York 17, N. Y.

HIGH-STRENGTH spotwelds result from well-cleaned parts, cotton-glove handling, regular electrode care, and hourly tests.

INSTRUMENT CABINET, side and front views, protects and supports vital equipment.

TUNGSTEN-ARC operator, winding up cabinet welding, is qualified for Navy work because he passed tough tests.

Welded aluminum suits sonar

IN BRIEF: Two welding processes were teamed to make light, strong, compact, and corrosion-resistant cabinets for seagoing sound system instruments.

CONSOLES AND CABINETS are almost as important in electronics as the instruments that go into them. First, they have to be strong. Otherwise, the precious innards might be damaged by vibration, impact, or non-support.

Cabinets need other qualities too: They need to be corrosion resistant, light, and compact. This is particularly true of sound-detecting Sonar systems. Anyone familiar with naval vessels knows that equipment rooms, like Sonar sound rooms, are not ballrooms. Every inch and ounce that can be saved means more space for other important equipment and for people.

Stromberg-Carlson Division of General Dynamics Corporation, Rochester, N. Y., builds Sonar cabinets to these exacting requirements. They also build the fabulous instruments that go inside, and a host of other electronic and communication equipment that displays the wizardry of Stromberg-Carlson.

USE STRAIN-HARDENED ALUMINUM

They make the cabinets in two sizes. The larger is almost 2 feet square and 5 feet high. The cabinets are made of 5052S- H32 and H34 aluminum alloy, because it's strong, light, and won't rust. This non-heat-treatable alloy contains 2.5 magnesium and 0.25 chromium, is strengthened by strain hardening. Only the drawer slides aren't of aluminum. There are of stainless steel for wear- and corrosion-resistance.

Stromberg-Carlson builds its cabinets in sections: base, back, and wrap-around sides. Side sheets, as well as channels and angles made from sheet, are ⅛-inch thick.

Welding is important for strong, trim cabinets. No other joining could do it as well. Stromberg-Carlson uses tungsten arc and resistance welding processes. They tungsten arc weld bottoms and backs because these are essentially butt-welded frames. They assemble them in accurate jigs and hold the parts with quick-acting toggle clamps. When frame parts fit loosely, operators add metal of the same composition as the base metal. The tungsten arc welding operators are qualified to do this work having passed tough Air Force welding tests. The Navy accepts the Air Force proof of proficiency for operators and equipment.

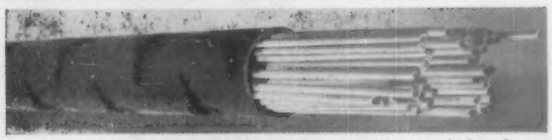
Second part of cabinet work is resistance welding. Stromberg-Carlson uses three, 100-kva, 3-phase

continued on page 56

← Circle No. 53 on Reader Service Card

3 METHODS OF PRODUCTION BRAZING ...Which is best for you?

FLUX COATED ROD



A new brazing concept—engineered flux-coated bronze—thick and thin extruded coatings to fit maintenance or production needs.

Work goes fast and even with ALL-STATE's extra thin coated bronze type alloys. Flux is extruded evenly, at thickness of only .0065, to assure excellent control and easy clean-up. Narrow beads are obtained with consistent proportion of flux to rod. Coated rods are highly efficient, require minimum amounts of rod and flux.

BARE ROD AND FLUX

Welding time was cut 25% and clean-up time 75% by using All-State nickel-silver and separate flux when brazing 1" mild steel tubing in power saw frame production.

For the occasional job or where brazing operations change from time to time, ALL-STATE suggests that bare bronze with #41 or #1 flux is the most flexible method, providing maximum control of capillary flow. Recommended for deep joints.

Nickel-silver rod with #11 flux is a versatile combination for joining dissimilar metals. TS up to 80,000 psi.

The bare rod and flux method permits use of special fluxes for unusual applications.

AUTOMATIC FLUXING SYSTEM

World's largest industrial stapling machine manufacturer found solution to assembly problem with high-strength All-State #11 nickel silver and automatic Jet Flux production brazing systems.

The fastest method of surface brazing, and the most economical for production work, is automatic fluxing, available for bronze, copper and steel brazing alloys. ALL-STATE's system permits finger-tip control of liquid flux, is easy to use, requires minimum cleanup.

JET FLUX dispenser, approved by Factory Mutual, is simple to fill, operate, clean, and re-fill. Can be used to feed liquid flux in exact amounts through oxy-gas or air-gas systems. Save on fuel cost by using Liquid Jet Flux with oxy-propane or natural gas stepped up to 8 lb. pressure. Send for free information on how to adapt torch for these lower costing fuels.

ALL-STATE has quality rods and fluxes for all brazing methods. Send for folder on JET FLUX. Also free 56-page Instruction Manual and Catalog.

Distributors everywhere

All-State ALL-STATE WELDING ALLOYS CO., INC.
White Plains, N.Y. Dial 914 WH 8-4646
QUALITY WITH SERVICE

For More Information Circle No. 2 on Reader Service Card.

SONAR CABINET

continued from page 55

EVERY HOUR two spot weld shear tests are pulled to make sure cabinet welds meet military specifications.

spot-welders. The large cabinet gets 900 spotwelds on 2-inch centers. This is as close as they dare put them. Closer welds would shunt current from the weld, making it small and weak.

The company strengthens side sheets with hat-shaped aluminum sections. Each side takes about 350 spotwelds. They use fixtures to align parts. Fixtures are made of aluminum, jig plate, and phenolic. The phenolic insulates fixture parts from the welding current.

Before cabinet parts are spotwelded they must be chemically cleaned, and cleanliness is ensured by this careful procedure :

1. Hot chemical dip (non-etching).
2. Two water rinses.
3. Deoxidizer dip.
4. Two water rinses.
5. Air dry with hot, filtered air.

During welding, operators keep the parts clean by handling them with cotton gloves. Fingerprints could prevent strong welds.

Because aluminum conducts heat and current rapidly, Stromberg-Carlson operators weld with high-heat, high pressure, short times. They set the machines according to proved process specifications.

TEST WELDS HOURLY

They also do other things to insure good welds: make hourly weld tests; dress electrodes frequently. How often they dress electrodes depends on the stock thickness. Weld-test blanks are of the same composition and gage as production parts. The blanks and production parts are cleaned together. Three tests are made every hour: two for shear tests, one for a cross sectional macroetch.

The shear-test machine, just steps away from the welders, is hydraulically powered, and calibrated to show shear strength direct. A typical shear test for $\frac{1}{8}$ to $\frac{1}{8}$ 5052S aluminum will pull 2,360 lb. This is about 200 lb. more than the lowest average required by Military Specification 6858A. All tests are recorded and records filed with job numbers—just in case a weld proves defective. • •

VICTOR

for hardfacing **NI-MN RODS** *for build-up* *for attachment*

Victor Ni-Manganese for Build-up is 4½% nickel, 13% manganese alloy, specifically developed for rebuilding manganese steel parts such as bucket teeth and lips; rail frogs and switches; crusher, dredge, pulverizer components. May be used as finish build-up or underbase; forms sound, slag-free welds; high deposition rate and good weldability. Deposits are austenitic with full Hadfield steel properties; nonmagnetic, tough and ductile; stands roughest abuse. Made in 5/32", 3/16" and 1/4" diameters; bare, for manual application by DC, reverse polarity.

Victor Ni-Manganese for Attachment welds crack-free, is specially recommended for difficult joining applications on manganese or carbon steel castings, such as: Dipper teeth and lips; track and drive sprockets; dragline pins and links; rail crossovers, switches and frogs; rolling mill parts; crusher screens, hammers, rolls and mantles; dredge parts. Deposited metal is extremely tough, wears well, has high impact strength. It's a wonderful, low-cost substitute for "stainless" where joining rather than corrosion resistance is chief factor. Made in 1/8", 5/32", 3/16" and 1/4" diameters for manual application by AC or DC, reverse polarity.

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VICTOR EQUIPMENT COMPANY *Alloy Rod & Metal Division* H-65

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For More Information Circle No. 71 on Reader Service Card.

Preheat And Interpass Temperatures For Carbon and Low Alloy Steels			
TYPE	DESIGNATION	TYPE ANALYSIS	PREHEAT, ° F.
Medium C	AISI 1030-1050	C 0.28-0.55	100-600
High C	AISI 1052-1080	C 0.47-0.88	500-800
Low-Alloy, High-Strength	Corten, Chromansil		200-400
	Manten, Yoloy		200-600
	T-1		150-200
AISI — Mn	AISI 1320-1330	C 0.18-0.33 Mn 1.60-1.90	200-550
AISI — Ni	AISI 2317-2330	C 0.15-0.33 Ni 3.25-3.75	200-500
AISI — Mo	AISI 4017-4028	C 0.15-0.30 Mo 0.20-0.30	100-400
AISI — Cr	AISI 5115-5120	C 0.13-0.22 Cr 0.70-0.90	100-350
	5130-5135	C 0.28-0.38 Cr 0.75-1.10	300-450
ASTM Cr-Mo Alloy Steels			
to 1¼ Cr		½ Cr — ½ Mo 1 Cr — ½ Mo 1¼ Cr — ½ Mo	250-400
1¾ Cr — 3 Cr		1¾ Cr — ½ Mo 2 Cr — ½ Mo 2¼ Cr — 1 Mo 3 Cr — 1 Mo	350-500
5 Cr — 9 Cr		5 Cr — ½ Mo 7 Cr — ½ Mo 9 Cr — 1 Mo	5 Cr — 450-650 7 Cr, 9 Cr — 550-700

Close control of preheating temperatures can prevent weld failures

by **HELMUT THIELSCH**, *metallurgical engineer, Grinnell Co., Providence*

IN BRIEF: Preheating prevents cracking, provides a favorable metallurgical structure, and minimizes weld shrinkage and distortion.

WHEN WELDING most alloy steels, preheat is far more important than postweld heat treatment. It does more to prevent cracking in the weld metal or the heat-affected zone, to provide a favorable metallurgical structure, and to minimize weld shrinkage and distortion.

On many alloy steels failure to preheat at all or enough or too low an interpass temperature may lead to cracks in the weld metal or to underbead cracking. Underbead cracking has occurred even on ½% molybdenum steel (0.10-0.20% C) welded without preheat.

The tendency to crack generally increases with the restraint across the weld and the wall thickness.

Metallurgist associate weld- and base metal-cracking in carbon and low-alloy steels with the formation of martensite. It is a hard, brittle structure which tends to form on cooling from welding temperatures. Hydrogen in the weld area increases the possibilities of cracking.

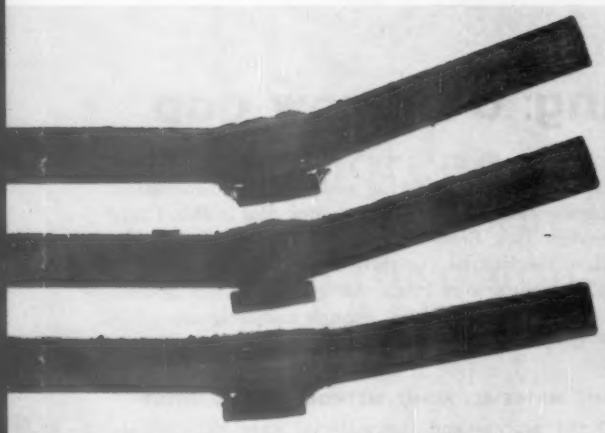
HOW PREHEATING HELPS

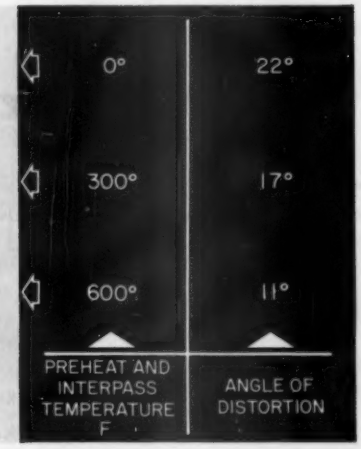
Preheating helps prevent cracks by doing these things:

1: Form a metallurgical structure softer than martensite, but also tougher, more ductile, and more resistant to cracking.

2: Diffuse more hydrogen out of the weld and adjacent heat-affected base metal area.

INTERPASS temperature is checked by standard thermometer (extreme left) during repair of cracked shaft. Resistance heating (left) measures and controls preheat and interpass temperatures while making butt weld in 1¼ Cr—½ Mo pipe.





DISTORTION in ⅝-inch AISI 1045 plates varies according to different preheat and interpass temperature.

3: Reduce the residual stresses and distortion across the weld area.

WHAT TEMPERATURES?

Preheat the higher carbon steels (over 0.30% C) and almost all alloy steels. Recommended preheat temperatures for the more common alloy steels are given in the accompanying table.

Apply the lower preheat temperatures to sections less than ½-inch thick, the higher value to sections over 2 inches thick. Use intermediate temperatures on intermediate thicknesses. Use higher preheating temperatures where carbon and alloy contents are in the upper part of the composition range.

Low-hydrogen electrodes are frequently preferred for the higher carbon steels and for many alloy steels. Thse electrodes help produce higher quality welds and lessen cracking and porosity. With them, the recommended preheat and interpass temperatures may be reduced slightly, but generally should not be below the recommended minimum values. When any alloy steel requires a preheat of 400°F or higher without low-hydrogen electrodes, do not lower the preheat temperature even if low-hydrogen electrodes are used.

Too high a preheat or interpass temperature will damage some alloy steels by producing unfavorable metallurgical structures or reducing notch toughness.

Preheat temperatures are controlled most readily by using induction heating with controlling thermocouples attached directly to the weld area. However, preheating often is done with gas burners or propane torches. Resistance heating is also used, but to a lesser extent.

When preheating has been done with torches, it is not uncommon for the interpass temperature to drop significantly below the temperature needed for proper welding. The operator should stop his welding frequently and check the temperature in the weld area.

HOW TO MEASURE TEMPERATURES

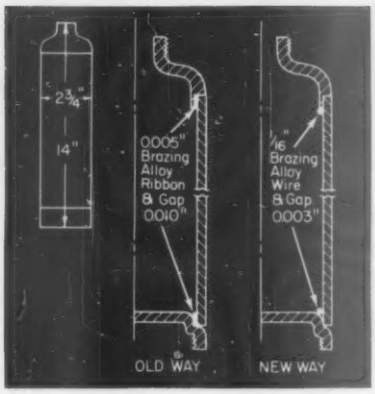
Temperatures can be measured effectively by dial thermometers. These are fastened to the steel surface by permanent Al-Ni-Co magnets. Three types of these thermometers are widely used:

1: Standard thermometers, which only read the temperature.

2: Thermometers with lag indicators (maximum re-

continued on page 62

INDUCTION BRAZING



INDUCTION BRAZING of 3-piece steel bottles for underwater sounding takes but a few seconds once the parts and alloy ring are fluxed.

Best bet for silver brazing: a narrow gap

IN BRIEF: Sometimes brazing fabricators do more changes that make a better, stronger part. than braze; their know-how often results in

FABRICATORS were having fits. They were anxious to nail down a Navy contract for bottle-shaped, 3-piece underwater sound signals. The Navy uses 2-¾-inch diameter, 15-inch-long bottles to sound (measure) the depth of the sea. When one sinks so far, it explodes. The time the sound takes to bounce from the sea floor to an instrument tells them the depth at that point.

The contract hinged on a fabricator's ability to make sample signal bottles with strong, sound, brazed joints and to show he could do it repeatedly. But no one could.

The metal wasn't at fault; the open and closed ends were of specification, screw-machine steel, accurately made. The signal body was of high quality steel tubing, well within size and gage tolerances. Parts fit snugly together, with just enough space between them for a ribbon of 45 percent silver brazing alloy. But the confused fabricators got weak, porous joints, and they didn't get the contract.

FINAL TEST of brazed sound signal is 50 lb. pressure hydrotest. Airline adapter screws on bottle end and pressure is turned on. Advantage of the clear plastic water tank: if there's a leak in the bottle, it's easy to see where it comes from.

At first, Allied Soldering and Brazing Corporation, Rochester, New York, did no better. But it didn't take President Jack Erdle long to spot the trouble after he squired the first two or three bottles through processing. The parts were clean, the alloy and flux beyond question, brazing was hot enough and long enough—still, the joints were weak.

RIGHT MATERIAL; RIGHT METHOD; WRONG JOINT

If the process and the material were okay, Erdle reasoned, the joint design's got to be wrong. He sliced through the brazed joints, polished the edges, studied them. When he gaged the silver alloy ribbon and measured the gap between parts, he whistled.

Erdle knew that in silver brazing, strength and soundness depend on having a joint clearance between 0.002 and 0.005 inches. In his specimen the alloy ribbon alone was 0.005. This meant that the gap between parts was around 0.010 inches; there wasn't a prayer of a chance for a good braze.

So Erdle got permission to redesign the bottle joints. First, he narrowed the gap between parts to 0.003 inch. Then, instead of ribbon brazing alloy, he used rings of 1/16-inch diameter wire, placed next to the overlapping joints (see sketch).

CAPILLARY ATTRACTION FILLS RIGHT JOINT

Actually, if you have the right clearance, silver alloys have the ability of penetrating joints all by themselves. It's called capillary attraction. This happens when brazing heat reaches 1145 to 1400°F and the alloy is fluid.

Allied's next batch of brazed bottles were perfect. On the strength of these samples, Allied got the contract. Since then, the company has brazed 25,000 bottles, and they've had mighty few rejects. In fact,

continued on page 62

PICTURE
OF A WELDOR
REACHING FOR
SATISFACTION

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In less than 2 minutes?

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For More Information Circle No. 73 on Reader Service Card.

SILVER BRAZING *continued from page 60*

for the last seven months, Allied hasn't had a single weak bottle.

Allied processes underwater sound signal bottles this way: 1. Vapor degrease parts; 2. brush-flux parts; dip-flux rings; assemble; 3. induction braze (Allied brazes the open end first so they can examine flow of the alloy); 4. wash flux off in water; 5. pickle; 6. hydrotest at 50 lb. pressure; 7. bonderize, 8. paint. • •

PREHEATING *continued from page 59*

set hands) which record the maximum temperatures reached.

3: Thermometers with an electric contactor to permit on-off temperature control where using electric resistance heating or induction heating methods.

The thermometers usually come in these ranges (Fahrenheit scale): —60° to 120°; —25° to 120°; 32° to 250°; 32° to 400°; 32° to 600°; 32° to 700°.

Do not use the thermometers at temperatures above 725°F. This may cause permanent loss of magnetism.

The magnetically-attaching thermometers are controlled by a bimetallic element and are accurate within 2%.

The magnets are so strong you can attach the thermometers to uneven surface, at corners, or on moving parts, such as weldments turning in a rotator.

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MATERIAL HANDLING DEVICES FOR THE MOST IN *Safety and Economy*

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6 SIZES

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For More Information Circle No. 49 on Reader Service Card.

Will explosive welding be the newest metal joining process?

IN BRIEF: Techniques are being developed for joining metals and metal combinations that are difficult or impossible to weld by other processes.

EXPLOSIVE WELDING may explode on the welding world. It is being studied by the National Northern Division of American Potash & Chemical Corp., West Hanover, Mass. They are doing the job for Wright Air Development Division, Dayton, Ohio. National Northern is experimenting with high temperature metals and those metals and metal combinations that are difficult or impossible to weld by other processes.

Here's what happened in the first series of tests on 4340 steel: National Northern used 3-inch-square test pieces 0.020 to 0.062 inches thick. They studied these four welding variables: surface treatment, explosive quantity, explosive geometry, and explosive type.

4340 CAN BE WELDED

Early results showed that 4340 could be welded, although the edges of the specimen (to ⅛ inch from the edge) will not weld. National Northern believes that more of this edge can be welded by changing the explosive geometry.

The percentage of the surface welded has not been determined. It is still too early to specify the exact conditions needed for good and complete welding. But, these are the facts so far:

Tests with two explosives show that the one with the higher detonation rate will bond more area. The two explosives were Trona 505, detonating at 7,800 m/s and Trona 509, detonating at 7,500 m/s.

Bonding of 4340 steel is better if the surface roughness is uniform. Treatments include:

Rough treatment: Roughening with emery cloth so scratches and lines can be seen by the naked eye.

Chemical treatment: Etching with a solution of aqua regia and cupric chloride for two minutes. A microscope shows the surface is roughened uniformly.

Certain ratios of explosive weight to stand-off will produce bonding. Stand-off distances were ½, 1, 1½, and 2 inches for these explosive weights: 50, 100, 150, and 200 grams.

National Northern will continue to develop more definite techniques for welding the 4340 steel. They will then develop techniques for other metals (molybdenum, beryllium, BC 120 VCA titanium, and 6 Al 4V titanium) and for combinations of metals (Type 310 stainless to molybdenum and columbium). National Northern uses a deoxidized arc-cast molybdenum alloy. • •

CUT BEVELING TIME BY 85% on Small Weldments

PULLMAX BEVELLER

The PULLMAX Beveller can be used to bevel cut large size plates with proper table support and feeding arrangement. But where the PULLMAX Beveller really pays off is in small segments difficult to bevel cut by burning and grinding.

Bevel small plate in both straight and mild radius shapes at speeds up to 11 ft. per min.

			A	B
A	1 Cut	Mild Steel	½"	1"
B	2 Cuts	Stainless Steel	¾"	¾"

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MANUFACTURING & BRAZING FACILITIES
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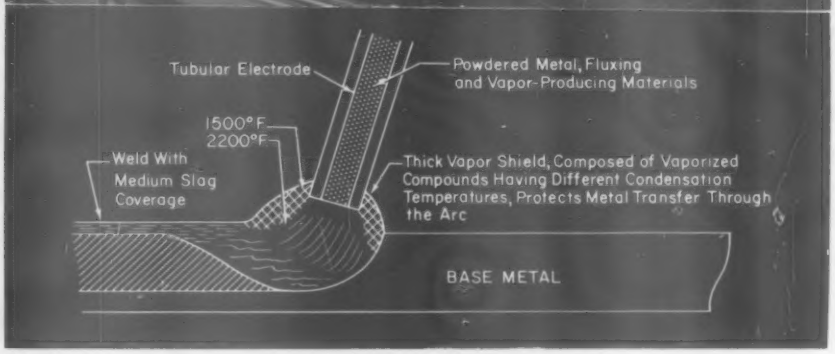
SEMI-AUTOMATIC WELDING

the equipment . . .

the theory . . .


Tubular Electrode
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2200°F
Weld With Medium Slag Coverage
Thick Vapor Shield, Composed of Vaporized Compounds Having Different Condensation Temperatures, Protects Metal Transfer Through the Arc
BASE METAL

New semi-automatic arc welding process speeds mild steel fabrication

IN BRIEF: New process is used by a Chicago manufacturer to increase welding speed and improve weld quality on butt welds in open-web steel joists.

Comparison of Welding Speeds on Horizontal Fillet Welds						
Weld Size		1/8	3/16	1/4	5/16	3/8
ARC SPEED (IPM)	Manual	18	15	15	11.2	9.1
	Innershield	50	42	25	18	11

NOTE: Arc speed is based on 100% operating factor for production welding. Typical operating factor, in percent, is manual, 40%, and Innershield, 60%.

A NEW SEMI-AUTOMATIC arc welding process has increased welding speed and improved weld quality on open-web steel joists. Ceco Steel Products Corp., Chicago, makes them. The flare butt welds join bent webs (of round stock) to angle chords. Ceco used to make these manually with 5/16-inch-diameter E6012 electrodes.

HIGH SPEED WELDING

The new process is a high-speed one. It uses a new electrode with a new shielding principle. There are no externally-introduced shielding or fluxing materials. This electrode is used with a new hand-held welding gun to which the electrode and welding current are continuously fed.

The process, called Innershield, was introduced several years ago by Lincoln Electric Co. It has been

used in specialized fully automatic applications calling for extremely high speeds. Now with a fast-fill electrode, a welding gun, and a wire feed mechanism the process is useful for semi-automatic work.

HOW DOES VAPOR SHIELDING WORK?

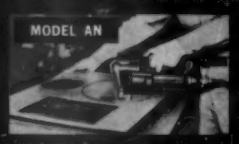
A tubular, fabricated electrode does the shielding. The mild steel tube provides filler metal and contains all ingredients necessary for shielding, deoxidizing, and fluxing. Part of these are inert metallic salts and oxides, which melt before the electrode, vaporizing at a temperature lower than the melted electrode metal. These metallic salts vaporize and expand when they meet the intense heat of the arc. They expand until they reach the isothermal cone surrounding the arc that corresponds to their condensing temperature. Then they recondense, forming a thick vapor shield around the arc and molten metal. This shield prevents contamination by the surrounding atmosphere. Other materials in the electrode have oxidizing and alloying functions in creating high grade weld metal.

THE COMPACT EQUIPMENT IS SIMPLE TO OPERATE

A wire feed mechanism contains wire reel and drive rolls. It feeds the wire and current through a cable to the welding gun. The gun is little more than a nozzle with a trigger and a pistol grip. The operator simply pulls the trigger to start the welding current and wire feed. He moves the gun along the seam, releasing the trigger when he wants to stop welding. He uses a motor-generator for power. • •

Circle No. 25 on Reader Service Card.

VERSATILE PORTABLE NIBBLERS



. . . CUT METALS* RIGHT ON THE JOB!

No matter the kind of metal or shape to be cut, FENWAY NIBBLERS (air powered or electric) operate with a cutting action which displaces the metal without distortion on both sides of the sheet: insures finished smooth edge, no chipping, no binding, no curling, no flaking . . . Cuts inside circles, squares, odd shaped holes on a per job or production line basis—saves time and materials in every application . . . Portable, light in weight, (8-20 pounds depending on model) —safe, easy to handle, proved durable in critical operations, minimum maintenance, guaranteed unconditionally.

*THE FENWAY NIBBLER CUTS: All non-ferrous metals, copper, brass, aluminum, etc. 10 gauge stainless steel and lighter; 8 gauge mild steel and lighter; tough pitch or asbestos coated corrugated steel ¼" cold or hot rolled steel and 5/16" aluminum.

Write Today for Complete Specifications, or Free Demonstration in your area

FENWAY MACHINE CO. INC.
1910 N. Marshall St., Phila. 22, Pa.

PROGRESSIVE makes BIG fixtures

For many years Progressive has pointed the way to better production in American Industry with new ideas in welding equipment and fixtures.

Today Progressive's modern facilities and extensive experience offer dependable solutions to the many unusual problems confronting industry the world over.

This gigantic (24' diameter x 70' length) booster assembly fixture for the Saturn missile, shown above, is a good example of Progressive's tremendous facilities and abilities.

Progressive's experience can save you time and money. Our engineers will gladly discuss your requirements.

THE PROGRESSIVE WELDER & MACHINE CO. 915 Oakland, Pontiac, Mich.

For More Information Circle No. 58 on Reader Service Card.

Circle No. 69 on Reader Service Card.

TILLMAN
GLOVES-GARMENTS

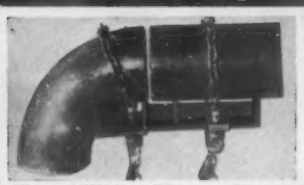
WELDORS
BUY FROM YOUR
DEALER

WELDING
GLOVES
MITTENS
AND
GARMENTS
NOW
IN
POLY BAGS

BRAZILIAN DEERSKIN
THE "STAY SOFT" LEATHER
GLOVES AND MITTENS

John Tillman & Company
1561 W. 19th St.
Long Beach, California

SEE JEWEL FOR . . .



The JEWEL Elbow Clamp
lines up welding elbows from 2½" to 8" at right angles to the pipe and holds them until tacked.

The JEWEL Angle Clamp
holds branch line at right angles to the main or headers. Takes any size main or branch from ½" to 12".

The JEWEL Flange Clamp
lines up the flange face at right angles to pipe end and holds until tacked. Takes size from 2½" to 16".

The JEWEL Pipe Clamp
. . . aligns and holds pipe for tacking. Two sizes: ½" to 8" and 8" to 16". Sturdy construction for hard usage.

The JEWEL Pipe Marker
markes a perfect hole and saddle on any pipe up to 20".
Write For Details

Jewel Manufacturing Co.
1841 University Ave., St. Paul 4, Minn.

Circle No. 37 on Reader Service Card.

AUTOMATIC WELDING

A GIRTH WELD in 3¾-inch steel takes 14 hours total floor time when two welding heads are used. It took 32 hours floor time with one head.

2 welding heads are faster than one

by **MICHAEL BENDER**, *chief metallurgist, Buflovak Equipment Division, Blaw-Knox Company*

IN BRIEF: Even automatic welding can be too slow sometimes. Here's what one company did about it.

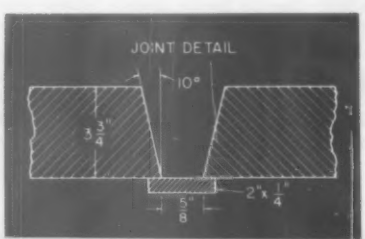
WE CAN SWITCH to automatic welding when manual welding is too slow. But, what can we do when even automatic welding isn't fast enough?

We were making three girth welds in each of four gas dehydrators. The longitudinal welds had already been made. The finished job is 90 inches in diameter and 22 feet long. It is made of 3¾-inch A-212 Grade B steel, 70,000 psi minimum tensile.

It took us 70 passes to make one joint. Total floor time: 32 hours.

We first lined up plate edges for welding (see photo and sketch). Then we made three root passes with E7018 electrodes. These close the gap between the backside of the vessel and the backup bar.

Then we welded with automatic submerged arc equipment. We welded at 16 ipm using a 7/32 inch diameter wire at 700 amps d.c.



SHELL PLATES for gas dehydrators are formed in a 2100-ton hydraulic press.

We switched to a multiple arc setup. We needed only 55 passes to make a joint. Total floor time 14 hours. Fit-up, joint details, and root passes stayed the same.

We welded at 20 ipm. We ran our 7/32 inch lead wire at 750 amps d.c. We ran our 5/32 inch lag wire at 750 amps a.c. We used the smaller wire with alternating current because it was too difficult to start and maintain an arc with a larger wire.

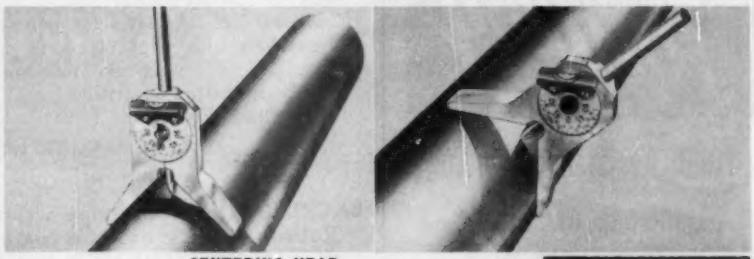
We chose our welding speed carefully. Welding too slow would have given us a heavy weld bead with a tendency to crack. Welding too fast would have brought poor fusion.

We got high quality, homogeneous welds with excellent physical properties (they must be stress relieved and radiographed.) They were comparable to the welds we got with a single arc. • •

For More Information Circle No. 20 on Reader Service Card.

PIPE LAYOUTS

OF ANY TYPE OR LOCATION!



CENTERING HEAD

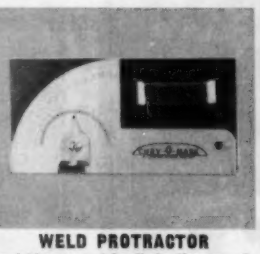
gives you FIVE TOOLS in ONE. It replaces the protractor, the centerhead, the center punch, the level, and the scale. It determines a pipe centerline at any angle. The CENTERING HEAD is pocket size and weighs only 9 ounces. Its Y-shaped head is accurately machined and has tangents and tips for centering and aligning. Dial Set Level is marked in 2½- and 10-degree graduations.

24" RADIUS MARKER

is folding compass of Dural aluminum. Fits pocket; weighs 8 ounces.

PIPE FLANGE ALIGNER

expands and centers inside 3" to 12" pipe to align flange for welding.



WELD PROTRACTOR

quickly, accurately finds the correct degree of angle on pipes or structurals.

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A CONTOUR MARKER PRODUCT

CONTOUR SALES CORPORATION
1843 East Compton Boulevard, Compton 2, California
See Your Welding Supply Dealer For All Curv-O-Mark Products

NEW from GLENDALE

REVOLUTIONARY
"Seesall Cover-Spec Goggles"
WITH ANGLED LENS DESIGN
give the
TOTAL VISION
plant safety directors have been looking for in Welders' Goggles.

NEW FEATURES:
- Blind spots eliminated
- Take in entire work area
- A boon to bi-focal wearers
- End neck fatigue, worker strain
- Fit over all spectacles
- Lightweight construction

Write for new 1961 catalog

Full details and specifications on request.

GLENDALE OPTICAL CO., Inc.
600 W. MERRICK ROAD, VALLEY STREAM, N. Y.
• S-7 SPECTACLES & LENSES • FACE SHIELDS • WELDER'S AND CHIPPER'S GOGGLES • DUST GOGGLES • ACID & CHEMICAL GOGGLES • FLASH SPECTACLES • PLASTIC EYESHIELDS • CHIPPING & GRINDING SPECTACLES • WELDING PLATES & LENSES

For More Information Circle No. 28 on Reader Service Card.

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YOUR Resistance Welding Electrode NEEDS Are OUR Business!

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FORGINGS:
CASTINGS:
HOLDERS:
ADAPTERS:

SPECIAL WELDING DIES or FIXTURES: TIPALOY *has them.*

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and other RWMA classes of alloys to fit your needs.

It is unwise to pay too much, but it is worse to pay too little!

Use TIPALOY and get 30% to 100% more performance for your money than you are now getting.

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Circle No. 70 on Reader Service Card.

REFERENCE DATA *catalogs, handbooks, manuals*

HOLD-DOWN CLAMPS for use on any metallic or wooden surface are described and illustrated in literature available from Adjustable Clamp Co. The clamps slide on or off the head of a holding-bolt that can be mounted in drilled holes or slots. Many uses for this versatile clamp are illustrated. Threads are protected from weld spatter.

Circle No. 300 on Reader Service Card.

BACKING RINGS for pipe welding are featured in a bulletin from Robvon Backing Ring Co. Shown are Types C, CC, and CCC backing rings that are available in carbon steel, wrought iron, chrome alloys, stainless, and aluminum.

Circle No. 301 on Reader Service Card.

SILICON AND SELENIUM RECTIFIERS are described and illustrated in condenses Catalog 100 from the Semiconductor Division of Syntron Co. Cutaway drawings show the construction features of silicon diodes and stacks, and of selenium rectifiers, stacks, and cartridge rectifiers. Graphs show typical operating characteristics.

Circle No. 302 on Reader Service Card.

ARC WELDING SCHOOL is described in a bulletin available from the Lincoln Electric Co. The Lincoln Welding School now offers subjects like pipe welding, hardsurfacing, alloy welding, semi-automatic submerged arc welding, and tungsten inert gas welding. The bulletin gives full details on registration, fees, courses, and hours.

Circle No. 303 on Reader Service Card.

TOGGLE CLAMPS for general and special use are listed in a 36-page catalog just published by Detroit Stamping Co. Catalog 77 illustrates typical toggle clamp applications and includes an accessories price list. Copies are available when requested on company letter head.

Circle No. 304 on Reader Service Card.

THAWING FROZEN WATER PIPES quickly and safely with low voltage electricity is described and illustrated in Bulletin EW-243 from Hobart Brothers Co. Tables show amperes and time required for thawing steel pipe with the company's Saf-T-Thaw equipment. Recommended cable sizes and maximum amperage loads of Hobart arc welders recommended for pipe thawing are given.

Circle No. 305 on Reader Service Card.

HARDENING STEEL tools and parts is explained in literature available from Hard-N-Tuff Corp. Described are the four steps needed in hardening low carbon steels. Included are hardening temperature ranges and heat color descriptions of different grades of steel.

Circle No. 306 on Reader Service Card.

15-INCH HEAVY-DUTY drill presses with positive-power variable drive or 5-speed drive are featured in a folder from Clausing Division of Atlas Press Co. Cutaway views show how each works. Specifications are given for all models. Optional equipment is listed.

Circle No. 307 on Reader Service Card.

FACTS AT YOUR FINGERTIPS: *If you want copies of the catalogs featured on these pages, just circle the appropriate numbers on the bound-in Reader Service Card. We'll do the rest.*

MEET THE MILLER A-C "S" SERIES

A BEST BUY by ANY TEST

Compare! Comparison proves that amp for amp and dollar for dollar this is your best deal in a heavy duty a-c welder.

Low first cost teams up with maintenance-free reliability to make the "S" very big on value.

Yet everything needed for top performance is here, including movable coil design, silicon steel cores, class B insulated copper coils, superior cooling, and 80 volts open circuit for instantaneous arc starting. Case is heavy gauge steel under baked enamel lifetime finish with dead front construction.

Complete information on the 300 or 500 ampere Miller "S" a-c welders will be forwarded promptly upon request.

miller ELECTRIC MANUFACTURING COMPANY • APPLETON • WISCONSIN

EXPORT OFFICE: 3 West 57th Street, New York 19, N.Y. • Distributed in Canada by Canadian Liquid Air Co., Ltd., Montreal

For More Information Circle No. 52 on Reader Service Card.

WEIGHT COMPUTATIONS for welded steel tubing are easily obtained from tables in a 16-page brochure prepared by the Electricweld Tube Division of Jones & Laughlin Steel Corp. Tables have dimensions and weight-per-foot for round mechanical tubing up to 10 inches, square, rectangular and pressure tubing up to 5 inches.

Circle No. 308 on Reader Service Card.

METAL CUT-OFF bandsaws are featured in literature from Famco Machine Co. Brochure BS-250 gives complete specifications and structural details on four saws that cut all shapes and types of metals.

Circle No. 309 on Reader Service Card.

OVERHEAD CRANES, carriers, tractors, transfer cranes, buckets and grabs are described in Booklet No. 2008-Q from the Cleveland Tramrail Division of the Cleveland Crane & Engineering Co. Detailed studies of track designs, peening and stresses are given.

Circle No. 310 on Reader Service Card.

NONDESTRUCTIVE TESTING equipment is featured in a 12-page bulletin from Sperry Products Co. Bulletin 00-105 describes the Sperry line of ultrasonic testing equipment. It also shows the company's portable X-ray and magnetic particle inspection equipment and supplies.

Circle No. 311 on Reader Service Card.

"SIMPLIFIED FABRICATION of Complex Components with Aluminum Dip-Brazing" is the long title of a short, 4-page brochure from John Gombos Co., Inc. The company's facilities are described and illustrated.

Circle No. 312 on Reader Service Card.

HARDFACING with powder spraying is featured in a brochure from Deloro Stellite, a division of Deloro Smelting & Refining Company, Limited. Spraying and fusing operations and applications are completely described.

Circle No. 313 on Reader Service Card.

BENDING OF PIPE, tubing, and structural shapes is the subject of a specification sheet available from Costello Engineering Corp. Operating characteristics are given for the company's 2M-R1 and 4M-R1 precision benders. Advantages are illustrated.

Circle No. 314 on Reader Service Card.

CHOP SAWS, electrical or gasoline powered are described and illustrated in a brochure from Commercial Tool & Die Co. Accessories and optional attachments are featured.

Circle No. 315 on Reader Service Card.

"MODERN HEAVY-DUTY Gas Cutting Machines" are featured in literature from Messer Cutting Machines, Inc. This literature is actually an 11-page illustrated article on heavy-duty cutting machines.

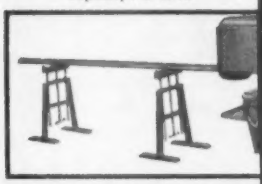
Circle No. 316 on Reader Service Card.

Model B (Wet or Dry) Dependable. Economical. Easily handles 5" rounds, 10" flats.

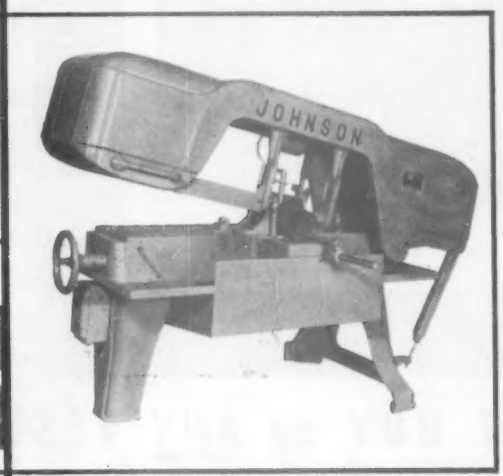
Johnson

Speaks for itself in ANY SHOP!

Model M (Mobile). Rolls to the job, inside or out. Capacity: 5" x 10"



Johnson Adjustable Stock Stand. Provides rigid, safe work support.



The Big Model J. (Wet or Dry) Fast. Tough. Accurate. Capacity: 10" rounds, 18" flats

The big, dependable Johnson delivers more saw for less money. It easily and accurately handles anything in your stock pile: rods, angles, tubes, heavy rounds, irregular shapes, and flats.

Whatever model fits your production requirements, you'll find Johnson versatility will boost your production and lower your metal cutting costs. Today, the Johnson saw speaks for itself in thousands of progressive shops . . . *why not yours?*

Johnson MANUFACTURING CORPORATION
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East Orange, N. J.	Des Plaines, Ill.	Berkeley, Calif.

For More Information Circle No. 38 on Reader Service Card.

DIVERSIFIED FACILITIES available for fabricating welded bridges, river barges, turbine generators, and power plants are illustrated in a brochure from Dravo Corp. "Through The Camera's Eye" is a comprehensive 52-page booklet that shows some of the work done by Dravo.

Circle No. 317 on Reader Service Card.

WELDING FACILITIES for tough welding problems are featured in literature from Rosemount Engineering Co. Described and illustrated is company's complete line of equipment for custom welding. Featured is a 36" chamber electron beam welder.

Circle No. 61 on Reader Service Card.

PLASTIC WELDERS for sealing and welding thermoplastics are featured in literature available from Kamlar Products Co. Bulletin 60-1 describes the construction features and operating procedures of each model. Accessories and parts are also listed.

Circle No. 318 on Reader Service Card.

EYE AND FACE protection is the subject of a 40-page catalog from Mine Safety Appliance Co. Catalog No. 0300-1 explains how the Sightguard line of eyewear combines optical quality, impact strength and a distinctive appearance in a variety of styles.

Circle No. 319 on Reader Service Card.

FLAME HARDENING equipment is described and illustrated in a 12-page brochure just released by Air Reduction Sales Co. The brochure discussed the various problems of oxy-acetylene flame hardening and shows how these problems can be solved with Airco's equipment.

Circle No. 320 on Reader Service Card.

A HEAVY-DUTY SAW for steel plate is described and illustrated in literature from Oliver Machinery Co. The company's No. 849 saw has a carbide-tipped circular saw blade which gives fast, clean cuts in heavy steel plate.

Circle No. 321 on Reader Service Card.

Circle No. 17 on Reader Service Card.

Chemclean "536"

- **Prepares Stainless and Aluminum for Welding.**
- **Removes Scale and Oxides before or after Welding.**

Eliminate costly, time-consuming grinding, scratch-brushing, or sanding on *stainless steel*. Simply wipe oxide off with one or two strokes of hand applicator. Clean small parts by dipping.

For Aluminum, just wipe or dip at room temperature

*

New! Coppa-Dip

Imparts a bright lustrous golden finish on Copper, Brass and Bronze. Retards oxidation.

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Write or Phone for free technical bulletin.

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Products Corporation

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INDUSTRIAL CHEMICALS AND SPECIALTIES

Specializing in Chemicals for Cleaning, Polishing, and Metal Finishing.

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BATEMAN BANTAM IRON WORKER

THE ONLY IRON WORKER OF ITS KIND ON THE MARKET TODAY

No Grinding Necessary After Cut. One Stroke Cycle Clutch Operated by Hand or Foot.

The Bateman "Bantam" cuts 2" x 2" x ¼" angles and ¼" x 4" flats. Standard punches will fit this machine. The Coper will cope 1¼" through ⅛" material. It will punch ½" hole through ¼" material. With the clutch open, the Bantam will make 44 strokes per minute. It is made of high-grade cast iron, with the clutch, pin and dog made of hardened steel. The blades are made with tool steel. It is powered with a fly wheel and gear drive, and uses a small ¾ hp motor, 1750 rpm.

Bateman Bantam with punch....$575.00
Shear only $495.00
Shipping wt. 750 lbs.

BATEMAN FOUNDRY & MACHINE
MINERAL WELLS, TEXAS

Get the lion's share of meaty facts out of this issue of WELDING DESIGN & FABRICATION before you pass it along to the next reader. Leaf through once more: If you want full details on any item, the Reader Service Card will bring them to you quickly. No postage needed.

"Four Nines"

make $99.99 equal $134.94!

That's right—buy the whole package and you save $34.95! This is a complete "Purox" welding and cutting outfit that you can amortize in just a few jobs.

Sold separately, these components would list at a total price of $134.94—still a good buy, considering the top quality that "Purox" stands for. But with this "Four Nines" kit, you get a complete outfit for welding, cutting, heating, and brazing . . . all first-quality materials at a budget price. The "Four Nines" Outfit includes a welding torch with three heads, cutting attachment with one nozzle, oxygen and acetylene regulators, 12½ feet each of oxygen and acetylene hose with fittings, friction lighter, and goggles.

See it at your LINDE distributor's. Or, write for literature to Linde Company, Division of Union Carbide Corporation, 270 Park Avenue, New York 17, N. Y. *In Canada,* Union Carbide Canada Limited, Linde Gases Division, Toronto 12.

LINDE COMPANY

UNION CARBIDE

"Linde," "Purox," and "Union Carbide" are registered trade marks of Union Carbide Corporation

For More Information Circle No. 43 on Reader Service Card.

STRESS FORMING on a shallow draw press is described and illustrated in a booklet from Cyril Bath Co. This booklet explains how the press produces a stronger, lighter, cheaper product.

Circle No. 12 on Reader Service Card.

SINGE-SOURCE SERVICE for welded fabrications is explained in a brochure from R. C. Mahon's Steel-Weld Division. Described in detail and illustrated are the company's extensive facilities (welding, machining, and assembling) for making strong, high quality, attractive weldments.

Circle No. 47 on Reader Service Card.

ABRASIVE CUTTING MACHINES, manual or power operated, are described in a catalog available from the Abrasive Machine Division, Beaver Pipe Tool, Inc. Machines for wet-, dry-, or angle-cutting are featured.

Circle No. 13 on Reader Service Card.

HARD SURFACING of austenitic manganese steel is the subject of a 4-page engineering data sheet available from Wall Colmonoy Corp. Data Sheet No. 55 tells which of three Colmonoy alloys to use on typical applications.

Circle No. 322 on Reader Service Card.

HIGH-STRENGTH, low carbon, alloy steel which can be welded by any process, is the subject of literature from Great Lakes Steel. N-A-XTRA high-strength is heat treated and is available in minimum yield strengths ranging from 80,000-110,000 psi. It is readily formed and fabricated.

Circle No. 60 on Reader Service Card.

GAS-SHIELDED metal-arc welding equipment catalog is available from Air Reduction Sales Co. Catalog ADC 717F has been revised to include all new manual and automatic equipment added to the Aircomatic line. Data is given on welding wires, shielding gases and gas delivery systems.

Circle No. 324 on Reader Service Card.

WELDED FABRICATIONS and their design are explained in a brochure available from the Steel Fabrication Co. Discussed are the facilities of the company and its ability to fabricate a wide variety of metals.

Circle No. 66 on Reader Service Card.

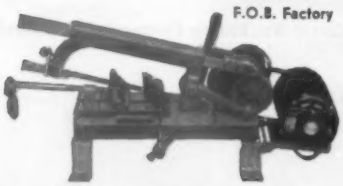
WELDING FIXTURES and equipment for solving unusual welding problems, are featured in literature from Progressive Welder & Machine Co. Explained and illustrated are how company engineers create new designs in welding fixtures for modern industry.

Circle No. 58 on Reader Service Card.

MAKING PIPE LAYOUTS with a centering head that combines five tools in one is explained in literature from Contour Sales Corp. Centering head is pocket-sized and weighs only 9 ounces. Other pipe layout equipment is also featured.

Circle No. 20 on Reader Service Card.

the "Little Giant" of
POWER HACKSAWS
COMPLETE ONLY $85.00
F.O.B. Factory



JEFFERSON "601"
Complete with motor and switch, wired, ready-to-go.

SAWS—bar, round, angle or pipe up to 5" x 4".

RUGGED—cast base, heavier guide bar support arms and guide bar with adjustable bronze wear plate and Oilite bearings throughout.

FEATURES—include fast acting 45° swivel vise, pressure relief on back stroke, length gauge bar, motor mount and ¼ h.p. motor. Built by builders of power hacksaws for industry since 1931.

Order from your Welding Equipment Dealer or write direct for details or prompt shipment.

KELLER DIV.

Sales Service Mfg. Co.

2365 University Ave., St. Paul 14P, Minn.

Circle No. 63 on Reader Service Card.

FOOT SHEARS are illustrated in literature from Famco Machine Co. Complete specifications are given on six different models with capacities up to 18 gage in mild steel and 22 gage in stainless. An exploded view shows construction features of each part of each shear.

Circle No. 325 on Reader Service Card.

MEDIUM DUTY CASTERS are featured in literature from Albion Industries, Inc. Specifications are given for five different wheel sizes for both swivel and rigid casters. Construction features are described.

Circle No. 326 on Reader Service Card.

POWER SAWS for production work or one-cut use are described and illustrated in a catalog published by the DoALL Company. The 12-page catalog features Models C-67 and C-68 for straight cut-off work and Models C-167A and C-168A for mitering and angular, as well as straight, cut-off work.

Circle No. 327 on Reader Service Card.

EYE AND FACE protection equipment is featured in a brochure available from the Glendale Optical Co. Illustrated are all types of safety glasses, goggles, and helmets.

Circle No. 28 on Reader Service Card.

MIXER-TYPE WELDING torches capable of welding any metal thickness from 28 gage to heavy plate are described in 8-page Form 55-005 from Linde Company, Division of Union Carbide Corp. The booklet explains the ability of the torches to handle gas flows as low as 2 cubic feet per hour up to 1500 cfh. Torches operate on any fuel gas.

Circle No. 323 on Reader Service Card.

BAND SAWS (wet or dry, portable or stationary) are featured in a brochure available from Johnson Manufacturing Corp. The brochure describes how the saws cut rods, angles, tubes, heavy rounds, irregular shapes, and flats.

Circle No. 38 on Reader Service Card.

TROUBLESHOOTER

—your LINDE distributor!

These days, more and more developments in welding hold the solution to knotty metalworking problems. The efficiency, economy, and versatility of modern welding methods and equipment are benefits which you should know about when joining or cutting metals.

Your nearby LINDE distributor is the best man to give you help. He is an independent local business man, easy to reach and talk to, fully stocked with a complete line, familiar with local industry. And he's backed by LINDE's technological leadership of more than 50 years' standing. Just as he can give fast delivery of all the superior equipment and materials you need—he can get you the specialized, and profitable, answers to your questions as they come up in the field.

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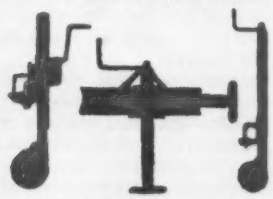
BULL DOG AXLE ASSEMBLIES

BULL DOG JACKS



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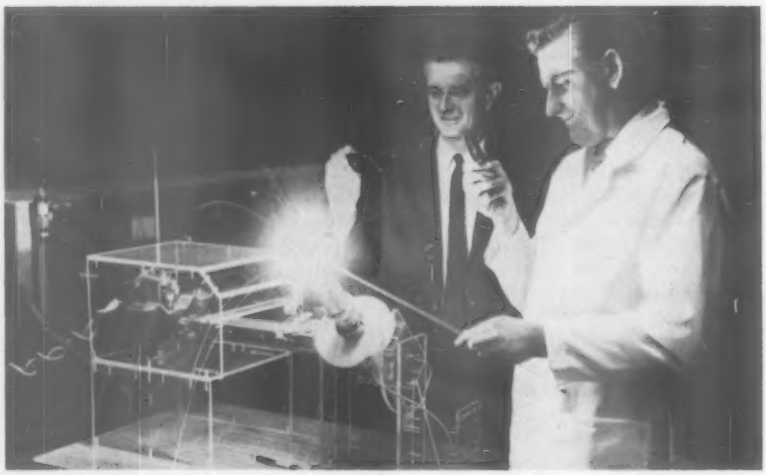
HAMMER BLOW TOOL CO.

WAUSAU • WISCONSIN

Circle No. 30 on Reader Service Card.

NEW PRODUCTS



Heat Without Fuel

A torch that produces a sun-hot flame, without fuel, has been developed by Amperex Electronic Corporation. The Plasma Torch splits gas molecules into atoms with the energy of a high frequency electro-magnetic field. The atoms recombine and release intense heat. None of the torch parts get hot. Thus, the torch lasts indefinitely.

Circle No. 200 on Reader Service Card.

Pipe Bending Machine

A series of compact pipe bending machines has been announced by Costello Engineering Corp. The benders were designed for Navy use aboard small ships. Costello benders can be used with or without mandrels. Scratch-free bends result from a follow-up pressure die during bending. The 2-inch model (shown) bends 2-inch IPS stainless pipe or 3½-inch x .065 stainless tubing.

Circle No. 201 on Reader Service Card.

Welding Power Supply

A medium range power supply has been developed by the vacuum tube products division of Hughes Aircraft Company. The supply has a range selector switch which allows either a 1 to 25 watt-second or a 10 to 250 watt-second range. Unit has power enough for 7,200 welds an hour, even in hard-to-weld metals.

Circle No. 202 on Reader Service Card.

Infrared Heater

A new line of electric infrared Comfort Heaters has been introduced by Fostoria Corporation. The Comfort Heater is designed for use in plant areas where drafts or breezes make space heaters impractical. This infrared heater transfers radiant energy direct to source without heating intervening air.

Circle No. 203 on Reader Service Card.

Induction Heaters

Miniature parts, usually very sensitive to heat, can now be soldered in a few seconds with little or no flux on the Reevelec Induction Roto-Heater. Maker is Reeve Electronics, Inc. The machine will operate automatically or semiautomatically. The operator merely loads and unloads the parts. Four models are available in 2½ to 10 KW ratings.

Circle No. 204 on Reader Service Card.

Alloy Solder

A new highly conductive solder-type alloy designed especially for electrical work has been announced by Eutectic Welding Alloys Corp. Neu-Tec-Tronic 157BN alloy is 50 percent more conductive than the standard 50-50 lead-tin solder. It can be applied by soldering iron, torch, hot plate or induction heating. It is available in 0.030- and ⅛-inch sizes.

Circle No. 205 on Reader Service Card.

Welding Helmet

A new welding helmet has been announced by Chicago Eye Shield Company. The helmet has a 4½" x 5¼" neoprene lens holder, delrin pivot assemblies, and nylon chin rest bolts. The shell is fiber glass. These combine to eliminate all electrical conductivity between the exterior and interior of the helmet.

A choice of glass plates or plastic filters may be used. The retainer absorbs shock, prevents lense breakage, and provides less heat transfer from the helmet. No tools are needed to change lens.

Circle No. 206 on Reader Service Card.

High-Conductivity Alloys

Extra large rolled plates of high-electrical conductivity are now being offered by Ampco Metal, Inc. Thicknesses include ⅜, ⅝, ⅞, and 1⅛ inch. Depending upon thickness, maximum widths range from 48 to 60 inches, maximum lengths from 96 to 156 inches.

Circle No. 207 on Reader Service Card.

Face Shields

Several face shields have been introduced by the Flood Safety Products Co. All shields have interchangeable and replaceable windows, in either acetate, vinyl or brass screen mesh. High impact and fire resistant windows are also available. All face shields come with Fit-Rite headgear.

Circle No. 208 on Reader Service Card.

Grinding Wheel

A miniature flexible grinding wheel, made by Merit Products, Inc., comes in 2½ or 3 inches diameter. It is used on shafts at speeds of 15,000 rpm. Grind-O-Flex comes in grits for wood, metal, or plastic usage. It is useful for hard-to-reach places.

Circle No. 209 on Reader Service Card.

Punch Press

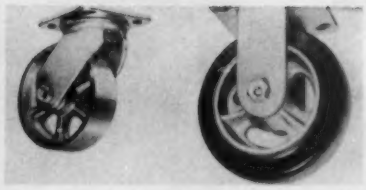
The Service Machine Co. has announced its Rouselle No. 6 OBI, 60 ton punch press. The press is available with a choice of drives, clutches and controls. Press features: Heavy Meehanite frame, double roller bearing flywheel, anti-friction back shaft, oversize bronze crank bearings, large inverted V-ways, and large die space.

Circle No. 210 on Reader Service Card.

Tensile Testing

Steel City Testing Machine, Inc. announces a new tensile testing machine with a capacity of 40,000 pounds. This floor-mounted, hydraulically-operated machine will test specimens up to 10 inches long and 2 inches wide. A set of jaws is furnished for tensile testing and a pair of plates for compression testing.

Circle No. 211 on Reader Service Card.



Medium Duty Casters

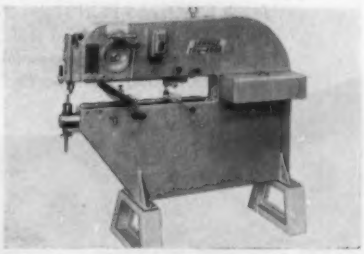
Albion Industries, Inc. has announced a line of medium duty casters. Both top plate and yoke are cold forged from ¼-inch steel plate. The "Series 16" line includes 3-¼-inch through 8-inch wheel sizes and eight wheel types, in rigid and swivel models.

Circle No. 212 on Reader Service Card.

Pipe-And-Tube Welder

This welder built by Latter Manufacturing Company welds stainless steel tubing automatically. Unit welds up to 3" o.d., ⅛" wall thickness. Control box contains speed control and arc control. The welder overlaps ⅛ turn after one complete turn.

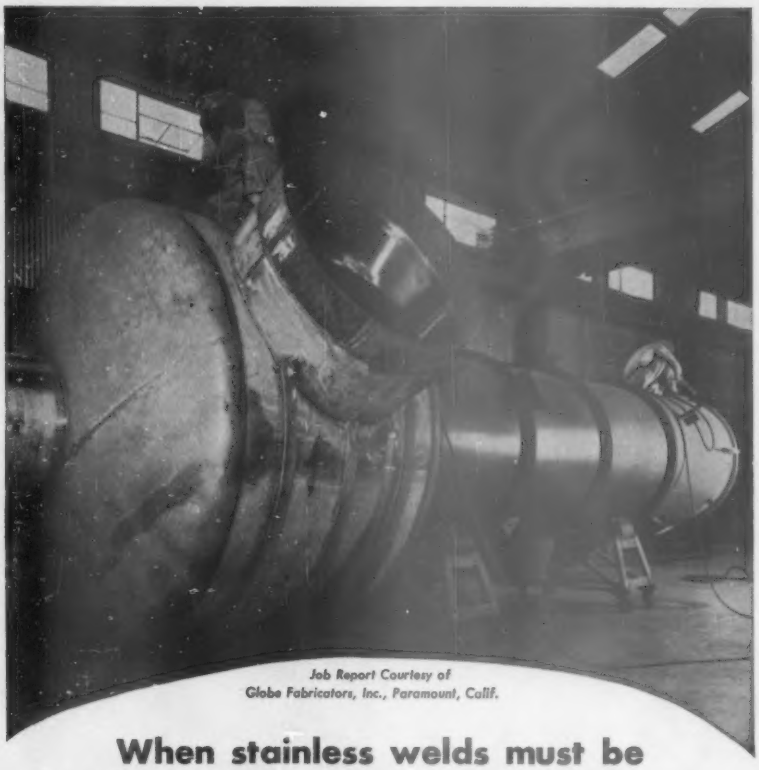
Circle No. 213 on Reader Service Card.



Metalworking Machine

This new model was introduced by Lennox Tool and Machine Builders. The machine can cut in the center of .150" mild steel plate; no starting hole is needed. It has an edge cutting capacity of 8 ga. in mild steel plate; 10-11 ga. in stainless steel and 5 ga. in copper. Drive mechanism has only 5 moving parts.

Circle No. 41 on Reader Service Card



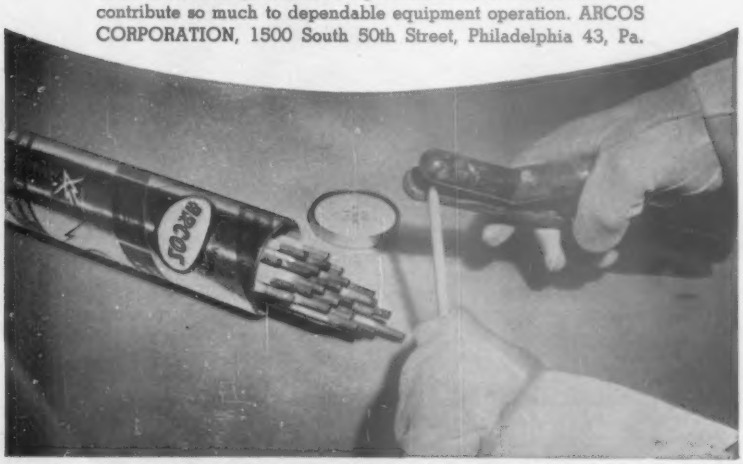
Job Report Courtesy of
Globe Fabricators, Inc., Paramount, Calif.

When stainless welds must be highly sanitary and corrosion resistant

WELD WITH ARCOS

STAINLESS ELECTRODES

Welded citrus fruit processing equipment such as this must *resist corrosion*, must *not contaminate* the food and must be *strong*. Type 304 stainless, used for all food contacting sections, was welded with Arcos Chromend K (Type 308) electrodes. For welding the non-stainless supporting members to stainless sections, Arcos Chromend HCN (Type 310) electrodes were used. Again, Arcos electrodes provided multiple benefits that cost so little and contribute so much to dependable equipment operation. ARCOS CORPORATION, 1500 South 50th Street, Philadelphia 43, Pa.



For More Information Circle No. 9 on Reader Service Card.

Double Apron Bending Brake

A line of bending brakes, called Form-All, has been introduced by Lake Erie Mchinery Corp. Line includes capacity range from 2 feet by 16 gage to 16 feet by ¾-inch thick. Brakes will form 1-piece, intricate shapes without the use of dies. The independently operated front and rear wings of the machines make sharp bends easy—on or at the end of a radius, and full 360 degree bends. Form-All brakes come in hand, air, and hydraulic operation. The large hydraulics are pushbutton operated and quickly adjusted.

Circle No. 214 on Reader Service Card.

Alkaline Paint Stripper

Chemclean Products Corp. has developed a paint stripper for zinc clad steels. Feature: it won't attack the zinc. Chemclean No. 441B strips quickly and completely, leaving a surface ready for immediate re-painting.

Circle No. 215 on Reader Service Card.

Hard Surfacing and Brazing Torch

A new torch for high temperature brazing and overlaying, with metal powders, has been announced by Coast Metals, Inc. The torch, with a built-in aspirator, feeds powdered metals into the oxy-acetylene flame. The powder is drawn from a small hopper attached to the torch. A variety of alloy powders are available for use with the torch.

Circle No. 216 on Reader Service Card.

Scarifier Tip

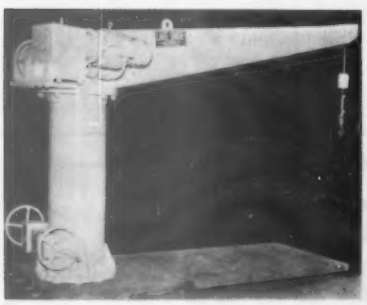
A new scarifier tip for road graders has been announced by Allied Steel & Tractor Products, Inc. Known as Twin-Tip, this part has a point on each end, permitting the tip to be reversed. Made of special alloy steel, the tips are drop forged and differentially heat treated. Parts lock in position.

Circle No. 217 on Reader Service Card.

Eyeshield

An eyeshield for chipping or welding, known as the Chiporweld Eyeshield, has been developed by Dockson Corp. The new design features molded plastic frame, adjustable elastic headband, interchangeable lenses; clear for chipping and green for welding.

Circle No. 218 on Reader Service Card.



Boom Crane

A cantilevered-boom crane with post mounting has been developed by Lake Shore, Inc. The crane is rated at 2000 lbs. and will lift at a 32 fpm. The boom length is 16 feet and has a hand operated arc swing of 270°.

Circle No. 219 on Reader Service Card.

Ultrasonic Welder

An ultrasonic spot welder with a new transducer construction and a unique self-tuning circuit has been announced by International Ultrasonics, Inc. The new construction doubles conventional welding capacity with no increase in generator output. The self-tuning feature assures weld uniformity and minimizes need for operator skill.

The welder is especially suited for joining parts in such electronic components as semi-conductors, printed circuit boards, and foil-wound transformers and capacitors.

Circle No. 220 on Reader Service Card.

Job report courtesy of
Midwest Piping Co., Inc., St. Louis, Mo.

When stainless welds must pass the most rigid tests possible

USE ARCOS QUALITY FILLER METALS

This 16" diameter Type 304 stainless elbow is part of the reactor cooling system in an atomic powered ship. In welding the two halves, the first pass was made with Arcos Chromend K (Type 308) electrodes. The balance of the joint was submerged arc welded with Arcosite Bonded Flux and Chromenar K (Type 308) wire. The inset shows results of a dramatic test of the Arcos weld metal so produced. A 2½" ring, cut from an elbow, was given the normal bend test—and then completely flattened—without a crack! Such performance is the reason why Arcos is preferred for all tough jobs. ARCOS CORPORATION, 1500 South 50th Street, Philadelphia 43, Pa.

Arcos Chromend K
(Stainless) Electrodes

Arcos Chromenar K Bare Wire
and Arcosite Bonded Flux

For More Information Circle No. 16 on Reader Service Card.

Micro-Wire Welding

A compact constant voltage motor generator welder, rated 200 amps at 25 volts, and designed for automatic welding has made it possible for Hobart Bros. Co. to offer their Micro-Wire welding process in a compact portable package. (Micro-Wire welding is a low amperage electric-arc process which continuously feeds a small diameter bare wire electrode into a welding zone shielded by a gas, usually CO_2 or a mixture of CO_2 and argon.)

The Model 1259 complete portable package unit includes a 200 amp constant voltage welder with ammeter and voltmeter, wire feed unit, welding gun, and all necessary accessories.

Circle No. 35 on Reader Service Card

Traveling Welder

A complete welding shop under the hood of a light pickup truck, is powered by the truck's 6-cylinder engine. Designed by Boesch Distributing Co., it carries a 155-300 amp. d.c. unit on one side of the engine, a 225-amp. a.c. unit on the other. A 115-volt generator on the truck engine is an electric source for power tools and welding lights.

Circle No. 221 on Reader Service Card.

Ultrasonic Joining

The Cavitron Corporation's new Universal Ultrasonic Micro-joining Kit will weld leads as fine as .0001 inch in diameter. The kit consists of an ultrasonic transducer hand piece and four basic inserts with tips for any micro-joining operation.

Circle No. 222 on Reader Service Card.

Rail Welder

Standard railroad rails can be butt-welded in ten minutes with a new Exomet, Inc. process. Called Exoweld, the method consists of a disposable mold that fits the contour of the rail, clamps, and a reactor basin. The aluminum-containing weld is as hard as the parent metal.

Circle No. 223 on Reader Service Card.

For *Accurate* WELDING HEATS...

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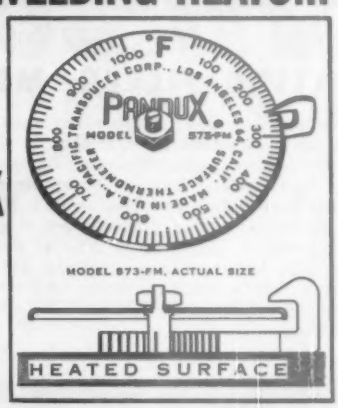
THERMOMETER

Indicates up to **1000°F.**

Accuracy ±2%



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For More Information Circle No. 57 on Reader Service Card.

PLASTIC WELDING

VALUABLE NEW DATA

During the last few years gas welding of plastics has been applied with particular success to a large and ever-increasing variety of constructions where it has proved invaluable. Information on this subject is rather scarce. This manual will be extremely valuable to practical welding people and to engineers who intend to incorporate plastic materials into their designs.

PRICE $6.00

WELDING DESIGN & FABRICATION

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CLEVELAND 15, OHIO

Grinding Wheels

The Atlantic Abrasive Corp. has announced a new reinforced resinoid depressed center disc wheel. Called Alpha, the rigid, abrasive grain wheels are triple reinforced. Wheels come in 7- and 9-inch diameters, ⅛-, 5/32-, ¼-, and ⅜-inch thicknesses. They have a ⅞-inch depressed center hole, and are manufactured in all grain sizes from 14 to 120.

Circle No. 224 on Reader Service Card.

Gas Welding Cart

A high pressure gas cylinder cart has been designed by Smith-Byrd Company, Inc. which eliminates the danger of cylinder droppage always possible with conventional two wheeled carts. The cart is easily loaded and has plenty of space for tools, welding rods, and hose.

Circle No. 225 on Reader Service Card.

Welding Regulator

A regulator available from General Electric corrects for line voltage changes in resistance welding. Welder heat is kept within plus or minus 2% of the preset value despite line voltage changes ranging from minus 20% to plus 10%. Unit plugs in, corrects at speed of 2 or 3 cycles.

Circle No. 226 on Reader Service Card.

Welding Thin Metals

A new unit for welding stainless steel, monel and materials as thin as one mill or less has been developed by Statham Instruments Inc. The machines are used to produce a hermetic seal weld. Unit can weld from 0 to 300 spots per minute; welding pressure can be adjusted up to 60 pounds. It can weld up to a three inch radius of spots, automatically or manually.

Circle No. 227 on Reader Service Card.

Arc-Plasma Spray Gun

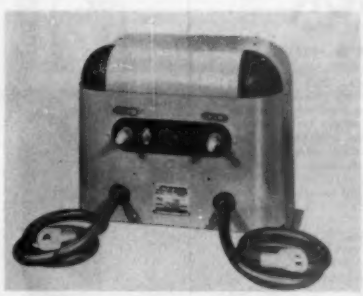
An arc-plasma hand spray gun developed by Plasmadine Corp. is less than 2" long and 1½" in diameter, said to be the smallest ever commercially produced. The new Plasmadyne 25 KW arc-plasma spray gun (shown compared in size to the 40 KW gun) operates at 60% efficiency and carries a 200 hour electrode life guarantee.

Circle No. 228 on Reader Service Card.

High Strength Steels

Armco Steel Corp. announces two new columbium bearing, high-strength, low-alloy steels. Armco High Strength No. 6 and No. 7 offer minimum yield strengths of 50,000 and 45,000 psi respectively. The new grades are available as plates, hot rolled sheet and hot-rolled strip. No. 6 has welding properties similar to a .20 carbon steel and No. 7 has properties similar to a .10 carbon steel. Yield strength will be certified if requested.

Circle No. 229 on Reader Service Card.



High-Frequency Stabilizer

An automatic arc starter and stabilizer, for use with any a.c. or d.c. welder, has been announced by Metal & Thermit Corporation. It eliminates false starts and stabilizes the arc on low-current settings for thin gage welding. Unit operates from a 230-volt a.c. source. Other primary voltages are available. The unit is rated at 600 amperes capacity.

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Circle No. 22 on Reader Service Card.

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Ultrasonic Micrometer

Branson Industries, Inc. has developed a caliper which attaches to their Sonoray ultrasonic flaw detector. The caliper measures the thickness of metal or plastic from one side to within ± 0.010 inch. The new accessory permits location of voids, slag inclusions, and other serious flaws. Knowing the depth of a surface flaw makes it possible to remove it rather than scrap the part.

Circle No. 231 on Reader Service Card.

Differential Hoist

An improved hoist has been developed by Thern Machine Co. The key to better operation is a new casting process which makes the sheave more accurate and stronger. Hoists come in 1,000- and 2,000- lb. sizes, with yoke of light weight, high strength aluminum and zinc plated, rust-resistant, welded chain.

Circle No. 232 on Reader Service Card.

Thyratrons

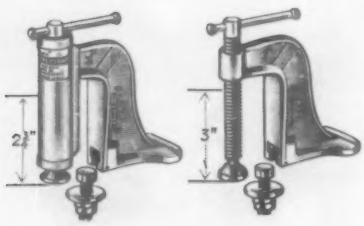
Two thyratron tubes for ignitor firing in pulse power welders have been developed by General Electric's Power Tube Department. The tubes have peak anode voltage ratings of 3,500 volts. They operate at a cathode peak current of 30 amperes; maximum cathode average current of 2.5 amperes.

Circle No. 233 on Reader Service Card.

Abrasive Discs

With the development of a new resinoid bond comes the announcement of a new grinding disc, B14, by Norton Company. The new disc cuts cooler and faster and gives more pieces per dressing. It is available in all shapes and sizes and with all types of mountings.

Circle No. 234 on Reader Service Card.



Hold Down Clamp

Adjustable Clamp Co. has developed another Jorgensen Hold-Down Clamp. The new one has a shield to protect the screw from weld spatter or other damage. A holding bolt makes it possible to clamp material in the middle of a table. The clamp has a vise-type handle.

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For More Information Circle No. 46 on Reader Service Card.

MURCO POWER DRIVEN forge hammers

MOTOR DRIVEN

Extremely powerful yet comparatively simple in design, MURCO Power Driven Forge Hammers can be operated under perfect control and with very little effort. Illustrated are the five sizes of motor driven models made in 25; 50; 100; 250; and 500 pounds RAM. The RAM design is a special feature . . . a steel casting, balanced and carefully machined, operates in V guides . . . large bearings for toe and toggle bolts . . . guide bearings extra long and wide. Perfect alignment of Ram Travel prevents twisting because the Ram is parallel with travel— a very important feature. Write today for complete specifications and price on the model to meet your requirements.

BELT DRIVEN 5 SIZES

MURCO Power Driven Forge Hammers are also made in five models belt driven in 25; 50; 100; 250; and 500 pound ram sizes.

MURCO

D. J. MURRAY MANUFACTURING CO.

Manufacturers Since 1883 WAUSAU, WISCONSIN

For More Information Circle No. 54 on Reader Service Card.

D.C. Welders

The National Cylinder Gas Division of Chemetron Corporation announces two new Sureweld diesel-driven d.c. welding power plants. The units have a high range of 150 to 350 amperes, and a low range of 50 to 200 amperes. They are equipped with rheostats to provide step ess current control, optional remote controls, and electric starters.

Circle No. 236 on Reader Service Card.

Drill Press

A new heavy-duty, all-purpose drill press has been announced by Clausing Division, Atlas Press Co. The drill offers a choice of instantly adjustable speeds from 500 to 4500 rpm while running or 5-speed drive with spindle speed from 410 to 5380 rpm. The spindle travels 4-¾ inches to drill to the center of a 15-inch circle.

Circle No. 237 on Reader Service Card.

Bench Welder

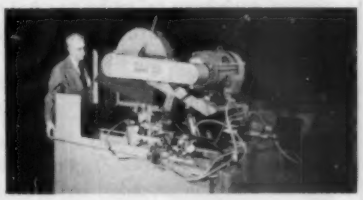
Sciaky Bros., Inc. has developed a SP.0 Type Benchwelder (Model 369B) for spot welding small thin-gage parts. Standard equipment includes a diaphragm head table mounted, electrical and pneumatic controls, and welding transformer—available from 300 to 2,000 volt-amperes.

Circle No. 238 on Reader Service Card.

Thermoplastic Welder

An all-purpose thermoplastic hand-welder for tacking or high-speed welding has been designed by Kamlar Products Co. It can be plugged into any 115 volt a.c. outlet to weld at speeds up to 60 inches per minute. Welding is accomplished with high-temperature air at a specially designed tip. Each unit has a 3-heat regulator, a pressure gage, airflow regulator, and two tips.

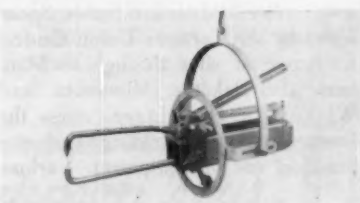
Circle No. 239 on Reader Service Card.



Modular Cutting Unit

A new cutting machine called Oscilla-Modular has been designed by Wallace Supplies Mfg. Co. The unit oscillates at speeds up to 100 strokes per minute. Length of stroke is from 5/8 inch to 6 inches. The machine comes in five wheel sizes: 16, 18, 20, 26 and 34 inches with capacities up to 8x8 solid steel.

Circle No. 240 on Reader Service Card.



Spot Welder Accessory

To take the weight off the operator's hands, Miller Electric Mfg. Co. has developed the Gyro-Bail. The accessory easily adjusts to any position on boom and counterweight or on a spring loaded cable. Since gun movement takes less effort, fatigue, errors, and accidents are reduced.

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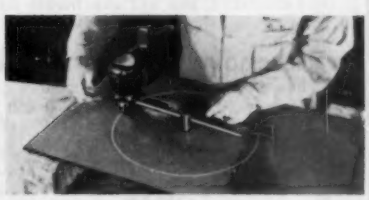

Nibbler Attachment

An adjustable attachment has been designed by Fenway Machine Co. to add to the versatility of Fenway Portable Nibblers. The attachment, available in two sizes, permits rapid cutting of circles up to 48-inch in 11 gage steel. The extension arm is quickly attached.

Circle No. 242 on Reader Service Card.

Circle No. 64 on Reader Service Card.

NEW SINGER SAFETY SHIELD

In the plant or on the job

★ LIGHTWEIGHT ★ RUST-PROOF
★ LOW COST ★ FIRE-RESISTANT
★ ASSEMBLED OR TAKEN APART IN MINUTES WITHOUT TOOLS

Just think of it—no hooks, no bolts, no screws. Ideal for welding, grinding, machining etc. or can be used straight line as a protecting divider. Rust-proof steel frame with heavy fire-resistant duck curtain—attaches in seconds with with heavy duty snap fasteners.

In 4 standard sizes:
18"x42", 36"x48", 36"x60", 36"x72"

NEW BIG CATALOG
Describes screens in detail.
Complete line of work gloves, welding gloves and safety clothing.

Ask your dealer or write:
Special Products Division
SINGER GLOVE MFG. CO.
860 W. WEED St., CHICAGO 22, ILL.

IN 1936, MORT CLARK, then Vice-President of the world's largest sign manufacturer, wanted a welded galvanized sign frame. Every welder manufacturer said it couldn't be done . . . Mort Clark did it, received a check and certificate of achievement from the Lincoln Welding Foundation—and

MORT CLARK'S **GALV-WELD** ALLOY ORIGINAL & GENUINE

WAS BORN

The Navy didn't believe, tested it 2384 hours in salt spray (100 hours is normal), then approved it. Westinghouse reports Galv-Weld roof sign, installed 1936—still perfect in 1959—23 YEARS LATER!

TIME PROVEN — MODESTLY PRICED
WHY EXPERIMENT?

Regalvanizes corrosive seams and areas where galvanizing is burned away by welding, skipped in hot dip galvanizing, or abraded in fabrication.

Eliminates corrosion areas produced by welding, so that weld will stand up under paint, WITHOUT rust, as on ornamental iron. Simply use residual heat from welding, or reheat, wire brush, and apply. No fluxing—No fumes.

Makes every welder a galvanizer of small weldments or parts. Repairs chipped porcelain, rusted appliances, rusted auto, truck or trailer bodies, frames, fenders, or other steel products. Can be readily refinished to match surrounding surface.

Ideal for pipe joints, galvanized structures, water and fuel tanks, duct systems, cold storage lockers, sinks, drains, washers, towers, steel buildings, railings, etc.

Some distributor franchises still available. Cash in on consistent campaign now running in 10 national magazines.

Mail Coupon Today

GALV-WELD PRODUCTS
Dept. WDF — Box 1383 — Bradenton, Fla.
Send Information User ☐ Distributor ☐
Dealer ☐ Free Sample ☐
Name .....
Address .....
City ..... State .....

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FOR BETTER, CLEANER, STRONGER, JOINTS

SAFE - NON TOXIC

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WELDING & BRAZING
FLUXES

V CHECK THIS COMPLETE LINE FOR ALL YOUR NEEDS

- ☐ 1. Cast Iron Welding Flux
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- ☐ 8. Aluminum Flux for Sheet Aluminum
- ☐ 9. Stainless Steel Welding Flux
- ☐ 11. Tinning Compound
- ☐ 15. Welding Flux for Magnesium Alloys
- ☐ 16. Silver Solder Paste Flux for Silver Brazing

Order "Anti-Borax" Fluxes By Number

Manufactured Only By
ANTI-BORAX COMPOUND CO., INC.
FORT WAYNE, INDIANA

EISLER makes the largest assortment of **ELECTRIC SPOT, WIRE BUTT, SEAM, TWEEZER, GUN** and **FLASH WELDERS.** We also carry in stock a variety of **WELDING TIPS** and **ACCESSORIES.**

EISLER ENGINEERING CO., INC.
735 So. 13th St., Newark 3, N.J.

Circle No. 21 on Reader Service Card.

A. O. Smith expands welding education

MILWAUKEE: Two different approaches have been taken by the A. O. Smith Corp. to give arc welding users a better knowledge of that subject.

3-DAY WELDING EXHIBITION

The first was a 3-day welding exhibition in Houston, Texas, last December. It was attended by 300 of the area's leading industrialists, farmers, fabricators, and contractors. The show featured working demonstrations of the latest techniques and equipment for a full range of welding applications, from utility farm welding to CO_2 production welding.

FARM WELDING SCHOOL

The second approach calls for the third consecutive year of a 30-session farm welding clinic. It is now underway in five Midwestern States. Sponsored by the Farmers Union Central Exchange at sites throughout Montana, the Dakotas, Minnesota, and Wisconsin, the classes stress the fundamentals of welding and the practical use of equipment. Various techniques are demonstrated, then performed by the students.

A. O. Smith furnishes the welding machines, the electrodes, and the instructor, John Rehm, sales engineer for Smith's Welding Products Division.

COMING EVENTS

February 1-2: 7th Midwest Welding Conference, Armour Research Foundation, Illinois Institute of Technology, Chicago.

March 20-24, 1961: 12th Western Metal Congress and Exposition, Pan-Pacific Auditorium, Los Angeles.

March 24-25, 1961: Kansas Welding Show, Wichita Section, A.W.S. Wichita, Kansas.

April 17-21, 1961: American Welding Society Convention and Welding Exposition, Sheraton-Atlantic Hotel and New York Coliseum, New York City.

April 24-25, 1961: International Acetylene Convention, Boston.

May 8-10, 1961: National Welding Supply Association Convention, New York City.

May 22-25: Design Engineering Show, Cobo Hall, Detroit.

NEWS BRIEFS

A NEW ACETYLENE-PRODUCING PLANT and five transfilling plants have been put in operation by National Cylinder Gas Division of Chemetron Corp. A combination acetylene plant-transfilling station was opened in Denver. Four other transfilling stations were opened in New Orleans, San Diego, Salt Lake City, and Pueblo, Colo.

A NEW SUBSIDIARY, Metal & Thermit AG, will act as Metal & Thermit Corporation's sales and licensing representative in Europe. The subsidiary will be located in Zug, Switzerland, and will also license its own patents and trademarks.

AIR REDUCTION PACIFIC has moved its Portland, Oregon, sales, service, and warehouse facilities into larger, modern quarters at 1325 N. W. Kearney St. For the past 15 years, the office had been at 430 N. W. 10th St.

MAGNAFLUX CORPORATION has acquired Metal Laboratories, Los Angeles. This acquisition gives Magnaflux a complete laboratory for nondestructive metallurgical, and physical testing.

A NEW LIQUID HYDROGEN PLANT to be built at Fontana, California, by Linde Company, Division of Union Carbide Corp., will have 26-tons-per-day capacity. It will supply 21 tons per day to the National Aeronautics and Space Administration under a $31,000,000 contract just awarded to Linde. Completion date is June, 1962.

A NORTH CAROLINA PLANT has been acquired by Square D Company. The company bought a 98,000-square foot plant located on 35 acres on the outskirts of Asheville. It will be headquarters for Square D's Commercial Control Division.

SKETCH OF PROPOSED new 250,000-square-foot plant of Crescent Company and its Carol Cable Division is examined by company executives, chamber of commerce and industrial development leaders.

Crescent Buys Site For New Wire and Cable Plant

PAWTUCKET, R. I.: Through the purchase of a 38-acre tract of land in nearby Lincoln, the Crescent Company, Inc., and its Carol Cable Division, has taken the first step toward the construction of a 250,000-square-foot, modern, one-story plant for the manufacture of its insulated wire and cable. The building site is located on George Washington Highway at Great Road in Lincoln. It is near a proposed new highway and in an area for which industrial park development is forecast.

Ray Thompson says...
"Thermo Tip Cleaners are the safest and best cleaners I have ever used. The non-breakable spiral design eliminates the hazard of breaking a cleaner in a cutting tip.
"The Thermo spiral does a better job of working out the carbon and slag without damaging the inside wall. The precision tolerance keeps the tip orifice to true size, giving a straight flame."
Ray Thompson is a recognized expert, repairing thousands of cutting tips each year. He is employed by the Pacific Tip Co. of Los Angeles, Calif.
Use Thermo Tip Cleaners and cut your tip repair costs, at the same time increasing your cutting efficiency. The only cleaner with a non-breakable money-back guarantee.
Send for a free sample today and find out for yourself why Thermo Tip Cleaners are better.
All progressive welding supply dealers stock Thermo Tip Cleaners.
THERMACOTE Company
108 SOUTH DE LACEY AVENUE • PASADENA, CALIFORNIA
For More Information Circle No. 68 on Reader Service Card.

About GWI

by W. G. Pinkstone
president
Grinding Wheel Institute

The Grinding Wheel Institute is a voluntary, non-profit association of manufacturers of grinding wheels and related products. It was organized for the development of efficient and safe grinding practices. The use of these products is important to the welding industry, particularly for weld grinding applications, abrasive cutting-off operations, and general purposes.

Through the activities of its various committees, the Institute has accomplished much benefit to grinding wheel users throughout all industry. Perhaps of outstanding importance has been the establishment of standards for the proper handling, care, storage and safe use of grinding wheels. In cooperation with the American Standards Association, the Safety Committee of the Institute has developed and the Institute publishes the American Standard Safety Code for "The Use, Care and Protection of Abrasive Wheels", ASA B7.1. All users of grinding wheels should be familiar with and adhere to the provisions of this 74 page code. Many state and other regulatory bodies have endorsed and adopted its provisions as well.

In cooperation with the Office of Technical Services, Commodity Standards Division, U. S. Department of Commerce, the Standardization Committee of the Institute has developed and the Institute publishes the 76 page Simplified Practice Recommendation (R-45), "Standard Shapes and Sizes of Grinding Wheels". Its provisions are followed by the various grinding wheel manufacturers and most grinding machine manufacturers. This standardization greatly simplified the specifying, identification and ordering of grind-

continued on page 84

GRINDING

continued from page 83

ing wheels. Recent additions to standard shapes include the identification of reinforced resinoid raised hub or depressed center wheels as Type 27, Depressed Center. This shape has become very popular and widely used for weld grinding.

The Grinding Wheel Institute has recently sponsored technical research studies at the Mellon Institute, Pittsburgh, Pa., Franklin Institute, Philadelphia, Pa., and the Cornell Aeronautical Research Laboratory, Buffalo, New York. While the findings of these projects are somewhat technical in nature, they have added considerably to the fund of knowledge about the theory of grinding, determination of residual stresses and the affects of the grinding process on metal parts.

Without question, the modern grinding wheel plays a vital role in our industrial economy. Its unique ability to produce fine finishes and close tolerances on metal parts has been responsible, in large measure, for the development of our mass production techniques which are dependent on the interchangeability of mass produced parts and components into the finished article at economical expense. • •

Glenn Pacific Changes Corporate Name

OAKLAND: Glenn Pacific Power Supply Corporation, manufacturers of welding and industrial supplies will be known as Glenn Pacific Corporation. President George G. Glenn said personnel, policies, products, and distribution would not change.

New Distributors And Sales Representatives

Ampco Metal, Inc., Milwaukee: Ace Welding & Safety Supply, Inc., Milwaukee.

Hobart Brothers Co., Troy, Ohio: Coss Welding Supply, Hagerstown, Md.; David F. Edgar, Bagley, Minn.; General Welding Products, Inc., Louisville, Ky.; K & K Welding Supply Co., Williston, North Dakota; National Supply & Service Co., Springfield, Missouri; R & R Welding Supply, Rock Island, Ill.; Southern Welding Supply Co., Spartanburg, South Dakota; Welders Sales & Service, Inc., Liberty, Missouri.

A. O. Smith Corp., Milwaukee: Florida Steel Corporation, Tampa; H. R. Toll Company, Minneapolis.

A NEW, COPPER-COLORED, laminated crepe paper imprinted in dark blue with the familiar "Western Man" symbol and registered script has been adopted by the Metals Division of Olin Mathieson Chemical Corp. to establish the identity of its Western Brass during shipment and in metalworking plants.

BECKER
Keen-Cut Electrodes
for use in
CARBON ARC-AIR JET GOUGING

KEEN-CUTS—for the best characteristics of carbon and graphite in a carbon arc cutting electrode. Higher current capacity . . . longer life . . . shorter cutting time . . . greater material removal . . . smooth surface gouge . . . controllable accuracy . . . hot stable cutting arc . . . elimination of smoke and gases.

And they're low in cost. Try BECKER KEEN-CUT ELECTRODES—black or copper coated, standard diameters, 12" lengths in 150 to 1400 amp. range—for the most efficient, labor-saving electrode in carbon arc/compressed air cutting.

A COMPLETE LINE OF CARBON AND GRAPHITE WELDING SUPPLIES—carbon and graphite electrodes, carbon rods and plates, welding paste, graphite cores and chills, graphite powder and particles of any mesh.

Write for Catalog

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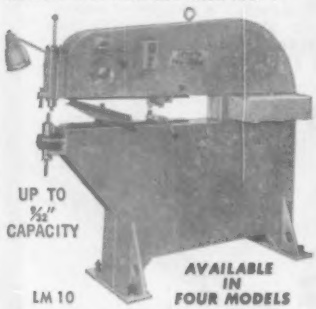
3442 South Laramie Ave.
CICERO 50, ILLINOIS
Circle No. 14 on Reader Service Card.

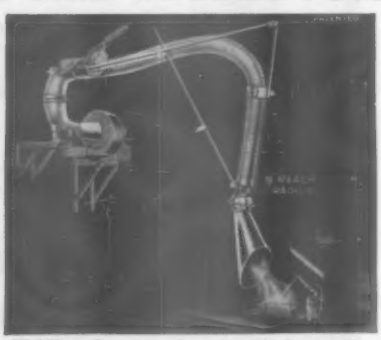
MORE FOR YOUR MONEY— AND "AMERICAN-MADE" TOO!
LENNOX TRU-EDGE® METLMASTR
Shearing • Forming • Piercing
5 MACHINES IN ONE
Before you buy — compare feature for feature the American-Made METLMASTR against all others — then compare also what this versatile metalworking machine costs you. The Lennox Tru-Edge METLMASTR is the only machine of its kind "Made in America by American Workers with American Know-how"!



Write today for complete information on Lennox Tru-Edge METLMASTRS — Profitwise, you'll be glad you did.

LENNOX
TOOL and MACHINE BUILDERS
653 North Baxter St. • Lima, Ohio
Circle No. 41 on Reader Service Card.

Remove Welding Fumes at the Source... with RUEMELIN FUME COLLECTOR



Welding shops equipped with Ruemelin Fume Collectors are assured of a clean shop atmosphere. Noxious fumes, heat and smoke are eliminated AT THEIR SOURCE. Improves working conditions . . . lessens fatigue . . . paves the way for increased plant production. Especially helpful in winter months when windows and doors are closed.

Note the new spring-loaded counterbalance mechanism which makes Fume Collectors much easier to handle.

WRITE FOR DETAILED INFORMATION
RUEMELIN MFG. CO.
3932 N. PALMER STREET • MILWAUKEE 12, WIS., U.S.A.
Mfrs. & Engineers • Sand Blast & Dust Collecting Equipment
Circle No. 62 on Reader Service Card.

Data Offered in This Month's Ads

Readers may obtain any of these free reference materials by circling the corresponding numbers on the Reader Service Cards

1: Pocket guides are available. **Air Reduction Sales Co.**

2: Jet flux folder offered. **All-State Welding Alloys Co., Inc.**

3: Metal cutting is explained in Bulletin DH-106. **Allison Campbell Division, American Chain & Cable Co., Inc.**

4: Alloy electrodes for every arc welding are described. **Alloy Rods Co.**

5: Low temperature silver brazing with special fluxes is the subject of a booklet. **American Platinum & Silver Div., Engelhard Industries.**

6: Beveler for small pieces is illustrated in literature. **American Pullmax Co., Inc.**

7: Projection welding dies are featured in Bulletin RW-10. **Ampco Metal, Inc.**

8: Fluxes for welding and brazing are listed. **Anti-Borax Compound Co., Inc.**

9: Electrodes for welding stainless are discussed. **Arcos Corporation.**

10: Weld cleaning tools are illustrated. **Atlas Welding Accessories, Inc.**

11: Punch and sheer for metal under 1/4-inch thick is featured in literature. **Bateman Foundry & Mach. Co.**

12: Shallow draw press is described in literature. **Cyril Bath Co.**

13: Abrasive cutting machines are listed in a catalog. **Beaver Pipe Tools, Inc.**

14: Carbon arc gouging using Keen-Cut electrodes is featured in material. **Becker Brothers Carbon Co.**

15: Arc spot weld gun and power source are described. **Bren Weld Welding Equipment.**

16: Stainless welding wire and flux are discussed. **Arcos Corporation.**

17: Oxidation and scale removal is subject of bulletin. **Chemclean Products Co.**

18: Welding helmets with detachable neoprene lens are featured. **Chicago Eye Shield Co.**

19: Metal shears with easily adjustable knife clearance is described in Catalog No. 2011. **Cleveland Crane & Engineering Co.**

20: Pipe layout equipment is featured. **Contour Sales Corp.**

21: Welding tips and spot welding equipment are shown. **Eisler Engineering Co., Inc.**

22: Exhaust systems of all sizes and for all purposes are listed. **Engwald Co.**

23: Arc welding accessories are discussed. **Erico Products, Inc.**

25: Portable nibblers for cutting all metals are featured. **Fenway Machine Co.**

27: Galvanizing of small parts and weldments is described in literature. **Galv-Weld Products.**

28: Eye, face and head protection is discussed. **Glendale Optical Co.**

29: Silver brazing alloys are explained in data. **Goldsmith Bros. Division, National Lead Co.**

30: Axle assemblies, jacks, couplers, and spindles are illustrated in a catalog. **Hammer Blow Tool Co.**

31: Silver brazing is the subject of Bulletin 20. **Handy & Harman.**

34: Resistance welding alloys and tips are featured. **Hercules Welding Products Co.**

35: Automatic wire feed package for gas shielded welding is featured in Bulletin DM-159. **Hobart Bros. Co.**

36: Ground clamps, cable connectors and cable lugs are featured. **Jackson Products.**

37: Clamps for various uses are described in literature. **Jewel Manufacturing Co.**

38: Band saws for all metal cutting are illustrated. **Johnson Manufacturing Corp.**

40: Manual arc welding accessories are featured. **Lenco, Inc.**

41: Shearing, forming and piercing machine is featured in literature. **Lennox Tool and Machine Builders.**

42: Automatic and semi-automatic welder with tubular electrode is described in Bulletin 5300.1. **Lincoln Electric Co.**

43: Welding and cutting outfit is featured. **Linde Company.**

44: Welding distributors and how they serve local needs are explained. **Linde Co.**

45: Welding and Cutting Apparatus Catalog No. 5900 is available. **Liquid Carbonic Div., General Dynamics.**

46: Dye penetrant inspection materials in spray cans are featured. **Magnaflux Corp.**

continued on page 86

Circle No. 34 on Reader Service Card.

"What's the secret of your strength, HERCULES?"
"No secret—I use only virgin alloys in my spotwelding tips and machine them with the best equipment money can buy."

Resistance Welding Alloys our only product. An abundant inventory of spotwelding tips and related accessories, as well as the various grades of copper-alloy bar stock, maintained at all times.

tips—holders—wheels—copper alloy bar stock, forgings and castings

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INSIST ON **HI-AMP**® MANUAL ARC WELDING ELECTRODE HOLDERS GROUND ATTACHMENTS

Buy from your local

WELDING SUPPLY HOUSE

LENCO, INC.
350 WEST ADAMS ST., JACKSON, MISSOURI

Circle No. 40 on Reader Service Card.

DATA FEATURED IN ADS

continued from page 85

47: Facilities, capacities and new fabricating techniques are featured. **R. C. Mahon.**

48: News and tips on resistance welding are offered. **P. R. Mallory & Co., Inc.**

49: Lifting clamps are described in catalog C-2. **Merrill Brothers.**

50: Reclaiming with metal spray guns is featured. **Metallizing Company of America.**

51: Wire gun and powder gun hard-surfacing is described. **Metco, Inc.**

52: Heavy duty a.c. welder is featured. **Miller Electric Mfg. Co.**

53: Sheet-metal welding with Linde's new Short Arc is described and illustrated. **Linde Company.**

54: Forge hammers are featured in literature. **D. J. Murray Manufacturing Co.**

55: Automatic and semi-automatic inert gas welding package is featured. **National Cylinder Gas Division, Chemetron Corp.**

57: Temperature indicator for weld heat up to 1000°F is illustrated. **Pacific Transducer Corp.**

58: Positioners for all size welding jobs are described. **Progressive Welder & Machine Co.**

60: Extra strength alloy steel is featured. **Great Lakes Steel, Division of National Steel Corp.**

61: Consultation and welding service is featured. **Rosemount Engineering Co.**

62: Welding fume removal is discussed in literature. **Ruemelin Mfg. Co.**

63: Power hacksaws complete with motor are discussed. **Sales Service Mfg. Co.**

64: Safety screens, gloves and safety clothes are featured in a catalog. **Singer Glove Mfg. Co.**

65: Arc welder construction is described and illustrated. **A. O. Smith Corp.**

66: Fabrications of all types are available. **Steel Fabricators Co.**

67: Tungsten electrodes for every welding need are featured. **Sylvania Electric Products Inc.**

68: Cutting tip cleaners are featured. **Thermacote Co.**

69: Gloves and garments for welders are described. **John Tillman & Co.**

70: Electrodes for resistance welding are featured in a catalog. **Tipaloy, Inc.**

71: Welding rods for build-up or attachment are featured. **Victor Equipment Co.**

72: Stainless brazing is the subject of literature. **Wall Colmonoy Corp.**

73: Weld joint make-up for pipe is featured. **Wallace Supplies Mfg. Co.**

CLASSIFIED

Cost of all ads in this section is $20 for the first inch and $15 for each additional inch or fraction. Rates for display ads in this section will be sent on request. All classified advertising payable in advance.

WELDING TRAINING

Complete or brush up courses in oxy-acetylene welding & cutting, Manual Arc, TIG, Automatic, Pipe (up & downhill) sheet metal, etc. Precode test training. Request bulletin from—

HOBART WELDING SCHOOL,
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Mechanical Engineering graduate or equivalent. To write welding procedures and handle training and qualification of welders. Primary experience must be in fusion welding including manual, submerged arc and inert gas shielded methods. Will work in carbon, stainless, nickel alloys, chrome steels, titanium, etc.

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AMBRAZE QUALITY BRAZING ALLOYS

Fully Guaranteed Materials
Meets all Gov't, AWS, ASTM Specifications.

Low Fuming Bronze Rod—Aluminum—Nickel Silver—Silver Solder—Flux—Phos Sil 0,2,6,15 Alloys

Write today for full details

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PATERSON LEITCH CO.

uses CADDY

ARC WELDING ACCESSORIES

PATERSON LEITCH (Cleveland, Ohio) is a general fabricator of steel structures. Jobs vary from small weldments weighing 2 lbs. up to giant 800 ton fabrications.

Illustrated is the complete breaching between the boiler and stack for a large power plant. 800 tons of steel were used in fabricating this portion of the project.

CADDY Type K-45 (400 amp.) Electrode Holders have been standard equipment at PATERSON LEITCH for over 10 years. Any factor causing loss of production is a serious matter with this company that has over fifty welding machines in constant use on a two shift basis.

CADDY equipment and the CADWELD Connections were tested in 1950 and proved superior to any holders previously used. According to the Welding Department, switching to CADDY increased holder life 30%.

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Erico Products, Inc.

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EMERSON ELECTRIC TIG-WELD 295

Welds Cast Iron, Rimmed Steel, Carbon Steel, Stainless Steel, Alloy Steel, Nickel, Copper and Copper Alloys, Aluminum and Magnesium

The EMERSON ELECTRIC TIG-WELD 295 for dual welding has built-in high frequency . . . Tungsten inert gas and manual stick electrode processes for both ferrous and non-ferrous work. It's a complete welding shop in one compact package . . . fully rated 295 amps with currents as low as 13 amps.

LOOK AT THESE BIG SELLING FEATURES

- Variable gas and water afterflow
- Direct-remote operation
- Adjustable spark intensity
- Welder on-off switch with pilot light
- High frequency arc stabilizer
- Electrically controlled gas and water valves
- Stainless steel water strainer
- High duty cycles

Write or phone today about profit opportunities on Emerson Electric HF295-30 and HF295-60, Dept. W1.

EMERSON ELECTRIC
of St. Louis

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